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FIRST ANNUAL REPORT

OF THE

OHIO AGRICULTURAL

EXPERIMENT STATION,

FOR

1882.

PRINTED BY ORDER OF THE STATE LEGISLATURE.

COLUMBUS:
MYERS BROTHERS, STATE PRINTERS.
1883.

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OHIO STATE UNIVERSITY,
COLUMBUS, O., *December* 31, 1882.

To Governor Charles Foster:

SIR: I have the honor to submit herewith the annual report of the Ohio Agricultural Experiment Station, for the year 1882.

I trust it will meet the approval of your Excellency and the General Assembly, and prove satisfactory to the farmers, for whose benefit the Station was established.

Very respectfully,

WILLIAM R. LAZENBY,
Director.

General

OFFICERS OF THE OHIO AGRICULTURAL EXPERIMENT STATION, 1882.

STATE BOARD OF CONTROL:

HIS EXC. GOV. CHARLES FOSTER, Fostoria,	*Ex-officio.*
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BOTANIST:

W. S. DEVOL.

SUPERINTENDENT OF FIELD EXPERIMENTS:

W. B. ALWOOD.

GENERAL ANNOUNCEMENT.

The Ohio Agricultural Experiment Station was established in accordance with an act of the General Assembly, approved April 17, 1882, "for the benefit of the interest of Practical and Scientific Agriculture, and for the development of the vast Agricultural resources of the State."

The experiments and investigations are carried on both in the field and laboratory, and deal with the following great Agricultural interests, viz: (1.) Grain Raising. (2.) Stock Farming and Dairy Husbandry. (3.) Fruit and Vegetable Culture. (4.) Forestry.

The Station is prepared to test varieties; to analyze and test fertilizers and manures, soils, waters, milks, cattle-food, etc.; to examine seeds that are suspected of being unsound or adulterated; to identify and name weeds and other plants; to investigate, and describe when known, the habits of injurious and beneficial insects, and other work of a similar character that properly comes within its province.

It is the desire of the Board of Control to make the Station as widely useful as its limited appropriation will admit. To this end we earnestly invite the co-operation of the people and press of the State.

All communications on Agricultural and Horticultural topics will be fairly considered, and as far as possible promptly answered. Detailed reports of experiments carefully and conscientiously made, will aid the Station in its work. Any citizen of Ohio, who is concerned in the promotion of Agriculture, has the right to apply to the Station for any information it can render, and the Station will cheerfully respond to all applications as far as lies in its power.

Samples of different varieties of corn, wheat, oats, barley, and other grains; the seeds of fruit and forest trees; vegetables and flowers, that are true to name; specimens of grasses, weeds, and other plants that may be of interest; sections of different varieties of wood; specimens of injurious and beneficial insects; these, and other articles and materials illustrative of any department of Agriculture, will be gladly received.

Address all communications to

WILLIAM R. LAZENBY,
Columbus, Ohio.

EXPERIMENTAL GROUNDS AND OFFICE,
AT THE
OHIO STATE UNIVERSITY, NORTH HIGH STREET, COLUMBUS, O.

PREFACE.

In presenting this, the First Annual Report of the Ohio Agricultural Experiment Station, a few words of explanation will not be out of place.

Scarcely more than eight months having elapsed since the establishment o the Station, much of the matter herein recorded is in the nature of a prospectus. But few of the experiments and tests inaugurated have been completed, and most of the work done has been preparatory.

In fact, we have been organizing, equipping and trying to make an experiment station, rather than directing work appropriate to one already established.

It has been the aim to set forth, whatever has been deemed worthy of report, in language that none can fail to understand. We have avoided, as far as possible, the use of unfamiliar terms, and have tried to make each paragraph clear and lucid.

No apology is needed for the somewhat lengthy introduction. Its careful perusal will give many of our farmers a clearer and better conception of the true mission and proper work of agricultural experiment stations.

A short history of the origin and work of the numerous European stations, including a brief sketch of those now in existence in our own country, has been prepared, to show the rapidity with which these institutions have multiplied, and the importance that is now attached to them.

We have reported few chemical analyses. This scarcely calls for any explanation. Our limited appropriation, and the fact that the most necessary and important work of this character is done by the State Board of Agriculture, are sufficient reasons for the omission.

To add to the value of the detailed reports of the observations and experiments made at the Station, they have been supplemented in some instances by the results of the labors of others, for which due credit is given.

The Director is responsible for the plans of the experiments and observations reported, but for careful and pains-taking supervision of the work undertaken much credit is due Superintendent W. B. Alwood. It is hoped that this report—imperfect and fragmentary though it be—will prove serviceable to the farmers of the State.

William R. Lazenby.

FIRST ANNUAL REPORT.

INTRODUCTORY.

WHAT DO WE MEAN BY "EXPERIMENT FOR THE PROMOTION OF AGRICULTURE?"

Agriculture is an art, the successful practice of which is based upon science. Science and art must not be confounded. *Art is practice*—it has to do with the ways and means of accomplishing objects. *Science* has to do with the explanation of these ways and means; it deals with causes and effects. In its strict significance it has nothing to do with practical application, and is not immediately concerned with the pecuniary results. Practical men, too, often regard the terms "science" and scientific as denoting something difficult to understand; they are fain to believe that a halo of mystery surrounds them. If we would bear in mind, however, that science is nothing more than "classified knowledge," or the sum of known truths pertaining to different subjects, we would save ourselves much trouble. Science is simply our working capital of known facts, which are classified, and a scientific experiment is an honest and careful seeking for further truths in the light of those already known.

On the other hand, the scientific man has too often claimed that the only valuable rules of practice are derived from the teachings of science, forgetting that they have nearly all come from experience and observation. It is true that science has explained many of these rules, but the rule itself may be of no more force in practice than it was before. Science has been largely useful in serving as a check upon hasty inferences, and by its explanations suggesting new lines of inquiry, observation and experiment.

All real agricultural progress is dependent upon both *art* and science—theory and practice. Field experiments, like the testing of varieties of grain, fruit, vegetables, etc., different methods of cultivation of various crops, the application of manures, the feeding of animals, etc., all have to do with the *art of agriculture.* They teach us how to get the greatest returns for the labor expended; in other words, how to diminish the cost of production.

Science may now come in, take the results of these field experiments to the laboratory, and teach us *why* they have been brought about.

THE DIFFERENCE BETWEEN SCIENTIFIC AND PRACTICAL EXPERIMENTS.

The distinction between *scientific* and *practical* experiments is chiefly to be found in the object sought. The methods of research, as we shall see, are essentially the same.

Scientific workers seek knowledge for its own sake, for the purpose of advancing the particular branch of science in which they are interested. *Practical experimenters* seek knowledge for immediate use. The former are satisfied with the discovery of new facts, new principles, new laws.

The latter are concerned chiefly with the beneficial results that may follow from a knowledge and application of these new facts and new laws. Perhaps it would be more correct to say, that the distinction between scientific and practical experiment exists rather in the *design* than in the result, the ultimate object in each case being truth.

Let us consider another point of difference between investigations in *science* and in *art*. The scientist must control, observe, and record all the conditions of his experiment, or he will not be successful as a scientific man. In most practical experiments we cannot control all the conditions. All that can be done is to control as many as possible, repeat or continue the experiment for a long time, and so obtain the probable average of the elements of error, the object being to arrive at certain rules of practice. From this it will be seen that we may have a successful practical experiment without any increase of real scientific knowledge.

The scientist investigates with more care, for his primary object is not simply to establish a rule of practice, but to discover some new fact or new law. Suppose a chemist wishes to know just what elements are essential to the life of a certain plant. He is not content with making an analysis of the soil in which the plant grew, or with analyzing the plant itself. This would, undoubtedly, tell him much. But, in order to settle the question, he takes distilled water, and adds to this certain definite substances, grows his plant in them, and watches the result. The man of science, from his training, can undertake to solve more intricate questions—those requiring a far greater degree of precision in weights and measures than could be undertaken by the practical man. Yet, this is merely a difference of degree, for, in whatever question the latter does attempt an answer, his methods, to be effective, must be as scientific as possible.

Whatever the difference of incentive to experiment, whatever the difference in the proximate object in view, the methods used, as far as they go, must be the same with practical worker and scientist.

The scientific man, if he understands practical matters, is more capable of improving, and rendering valuable a practical experiment, than a man unacquainted with science.

On the other hand, a practical man who has a clear conception and just appreciation of science, can suggest lines of scientific experiment that may lead to more valuable results than any the scientist can suggest. The two lines of experimentation should go hand in hand. To be really valuable most practical experiments must be supplemented by the aid of science, and many scientific experiments should be supplemented by the aid of those expert in practice.

REQUISITES FOR SUCCESS IN PRACTICAL EXPERIMENTS.

(1.) *There must be a sound basis of scientific as well as practical knowledge.* Science must be recognized and accepted as the only true, substantial foundation of any signal improvement in the art of agriculture. Many of the questions which the experimenter is called upon to settle are those which require the largest knowledge of nature, and the fullest command of science. A thorough acquaintance with the laws of vegetable life and growth is indispensable. Again, one must know something of what has already been done, and how best to go to work to solve the question in hand. An experiment made to discover something already known, or something not worth knowing, or one whose methods are so defective that it proves nothing, is of very little value.

(2) *There must be singleness of purpose.* That is, every experiment should have one distinct and definite object in view. Any satisfactory agricultural experiment requires absolute simplicity of purpose. Many experiments are of little or no value, because too much is attempted. There should be a clear conception of the question to be solved, and one primary point to settle at a time.

(3.) *We must eliminate, as far as possible, every element of error.* In field experiments it is impossible to secure absolute accuracy, and we need not think because duplicated experiments do not exactly agree they are of no value. If we did we might just as well stop all field experimentation at once, for, where the conditions cannot be controlled, no two similar experiments will precisely agree. The rule, which should always be observed. is, to note carefully all the conditions and attendant circumstances. Make sure of every step as you proceed. Be exceedingly particular and watchful on every point. Close every possible loop-hole of error. Better have one experiment without any error that can be eliminated than twenty containing such error. The reason why there is so little advance in agriculture, though thousands of so-called experiments are being tried every year, is because so many of them are superficial and worthless. These experiments resemble the familiar observation of the quack doctor who, having seen a German recover and a Frenchman die under a diet of sauerkraut and bologne sausage, entered these articles of food on his note-book as a specific cure for all Teutons, but deadly poison to all Gauls.

(4.) *There must be absolute honesty.* It will not do merely to think a certain result has been attained. We must know it. After carefully noting all the conditions, we should be sure to announce the results just as they are—no more, no less. Many an experiment has been started with great care, closely watched for a time, then, because certain indications pointed to some expected or hoped-for result, a conclusion is jumped at before the experiment is completed. These *guess* experiments have often been reported as illustrating general laws without any sound basis for the assumption, and it is just this which makes a large part of our experimental work worthless, and a stumbling block to all who are trying to learn the truth.

(5.) *In practical experiments we should adopt methods that are in accordance with the established rules of the best farm-practice.* We should, as far as possible, pursue the same system that is ordinarily practiced by our best farmers, for their customs are usually founded upon well-established laws. To illustrate: In conducting experiments in feeding sheep, swine, or cattle, it would undoubtedly be best to keep several animals of a kind together, because the separation, or putting the animals each in a separate pen, though it might be interesting as an experiment, could not be reduced to general practice. A strictly scientific experiment, however, might require the separation of animals, because in that way the experiment could be made more exact.

It must be remembered, however, that while our practical experiments should accord with our best known methods of farm management, they must also be conducted according to the rules of scientific research. That, is scrupulous account must be taken of every condition and attendant circumstance that may possibly influence the results.

(6.) *Practical experiments, to be conclusive or of general application, must be repeated.* The result of a single experiment, provided due allowance is made for all modifying influences, may be useful and suggestive in the way of indicating the needs of a particular soil—the comparative value of different varieties for special localities, etc.—while it would be of no value in the way of settling general principles. Continuous field experiments with the same crop, on the same plots, year after year, is the only method of securing results of the highest value. Accuracy is of the first importance, and then the repetition of an accurate experiment is essential. We must not delude ourselves with the idea that repetition in itself insures accuracy, for, if our methods are defective, we may repeat the experiment through all time and never attain a satisfactory result. In may be remarked, in conclusion, that to inaugurate and conduct to its full completion a series of practical agricultural experiments, requires close observation, painstaking care, and a high degree of skill.

IMPORTANT WORK TO BE DONE.

For the sake of convenience we have divided the great agricultural interest of the State of Ohio into four well marked departments, viz: (1.) Grain Raising. (2.) Stock Farming and Dairy Husbandry. (3.) Fruit and Vegetable Culture. (4.) Forestry.

The first division is the most important, because corn and wheat rank first as staple products. Owing to the prominent position of these cereals in the agriculture of Ohio—a series of systematic experiments, whose object shall be to improve upon the best known methods of their cultivation—can scarcely fail to be of great practical interest to a great majority of the farmers of our State. Among the practical questions that demand and should receive the earnest attention of the Experiment Station are the following: Careful tests of the comparative value of the best varieties; tests in thick and thin seeding; in sowing or planting at different dates, different distances, and different depths; in different methods of manuring and applying fertilizers; different systems of culture, etc., etc.

The following scientific work should also be done in this department: (1.) An analysis of all the fertilizers used in the field experiment. (2.) An analysis of such soils experimented upon as show marked peculiarities. (3.) Investigations of such diseases as rust, smut, blight, mildew, etc., together with the insects injurious and beneficial. (4.) The identification and description of grasses, weeds, etc. (5.) Testing the vitality of seeds, and examining them for adulterations, etc. (6.) The general analysis of grains, straw, waters, and other materials and products related to "grain raising." In connection with the above experiment careful meteorological observations and records of soil temperature should be taken daily.

STOCK FARMING AND DAIRY HUSBANDRY.

Relating to this subject the testing of clover, grasses, and various soiling crops; the effect of different times and methods of harvesting the same; the effect of different rations in fattening, and upon the yield and quality of the milk; the comparative susceptibility of different breeds of cattle to special foods and systems of feeding, etc., would give a wide field for experimental work.

Pertaining to the dairy, especially, the testing of different methods of setting milk, and separating cream; of manufacturing, curing, and preserving butter and cheese; the abortion of cows, etc., offer, likewise, an interesting and instructive field for both scientific and practical experiments.

FRUIT AND VEGETABLE CULTURE.

In regard to fruit culture the field is almost untrodden. We have no definite knowledge regarding the effect of special manures on the yield and quality of fruit. We know but little of the effect of different methods of propagation upon the growth, productiveness, and longevity of fruit plants and trees. The exact causes and true nature of "pear blight" and "peach yellows" are unknown. There are no practical remedies yet discovered for many of our worst insect enemies; the chemical changes that fruit undergoes in ripening different methods of drying and preserving green fruit; the production of new varieties adapted to special systems of culture, or to special conditions of soil and location; these, and many other questions furnish a rich field for experimentation. Surely, nothing can justify a neglect or failure to do something for the encouragement and advancement of an interest of such public importance to the whole State as "Fruit and Vegetable Culture."

FORESTRY.

The rapid and reckless destruction of our forests is compelling those who must use timber to be seriously interested in its future supply. It is also believed by many that this improvidence is beginning to seriously affect our climate. Hence, the question of forest-tree culture is one demanding our instant and most earnest attention, and offers a most fruitful field for well-directed, patient, persistent experimental work. To show how our best timber-trees can be easily, cheaply and successfully grown from seed; to determine the best varieties for special purposes; the best methods of improving and extending forests; the best time to cut, and the best way to preserve timber, etc , would be rendering a service of untold value to our State and country.

NEEDS OF AN AGRICULTURAL EXPERIMENT STATION.

The first and most essential need is a well-equipped farm of moderate size. This should be furnished with all the necessary appliances for grain-raising and stock-farming. It should also have well established orchards and gardens, where all the most important varieties of fruits and vegetables could be grown. It should contain, likewise, a small dairy, with a suitable building for the manufacture of butter and cheese. This thoroughly furnished farm should be situated near—or have upon it—ample laboratories, and other facilities for carrying on the scientific work of the Station.

HISTORICAL.

A BRIEF SKETCH OF AGRICULTURAL EXPERIMENT STATIONS.

The first great problem which every man is called upon to solve is that of subsistence. The crude material wherefrom he is to be fed and clad, comes directly or indirectly from the soil. The art of agriculture consists in the transformation of crude, comparatively valueless substances into products that nourish and comfort the body, and then strengthen and develop the mind.

Farming, therefore, is the first, as it is the most essential of human pursuits. All men depend finally on the produce of the field for their sustenance. Should the fields fail to produce their harvest, not all the gold and silver in the world could satisfy a single pang of hunger. Bountiful harvests mean life and happiness; a failure of crops means death and misery. Without agriculture there can be no civilization, and the advancement of agriculture means the advancement and progress of the human race. As soon as man began to till the soil, he began to emerge from a condition of savagery and squalor, taking the first step on the road to higher development. What was it that doomed to certain decay and speedy dissolution those great empires of antiquity? That there were vices inherent in their social and political life we cannot deny, and yet, history tells us, their decline only began when the soil began to show signs of exhaustion and impoverishment. When it became divested of its fertility, and ultimately lost its capacity for production, then the light of these great empires went out, and, instead of being capitals and centers of power and influence, they became ruins surrounded by deserts. Since those ancient days, until a comparatively recent date, the history of agriculture has been a constant repetition. We have no record of any strictly scientific progress for the science of those days was of little or no aid to agriculture. Those who cultivated the soil knew that their crops were growing less and less, but no one thought of the *cause* of diminished production. The few scientists, who, from time to time, turned their attention towards agriculture, were treated as wild theorists and idle dreamers. The most important researches were not valued by the practical men. All application of the facts and principles of science to any of the useful arts were treated with suspicion, and the relation of science to agriculture was one of antagonism. This continued until about the year 1840, at which date the tide began to turn. The prejudices against scientific research gradually weakened, until to-day science is regarded as the only true basis of the art of agriculture.

About this time Liebig showed the intimate relations existing between Chemistry and the cultivation of crops. He confidently asserted, because he knew, that the soil contained certain mineral constituents necessary to the nutrition of plants. From this dictum it followed that if these mineral constituents were withdrawn the soil would be the poorer by just the amount taken, and if continued drafts were made without any replacement, the soil would, in time, cease to be productive. It is the province of chemistry to point out what essential elements of plant food are withdrawn from the soil by different crops, and to seek out and make known the best means of replacing this waste. Very soon the best educated and most enterprising landlords of Europe were reaping a rich reward from the application of chemistry to agriculture. Zealous and enthusiastic workers, in behalf of the promotion of the greatest of human arts, began to multiply. Lawes and Gilbert in England, Boussingault in France, the "Agricultural Chemistry Association," of Scotland, inaugurated the most painstaking and laborious investigations. Chemistry was now regarded as the great ally of agriculture, and the immense advantages to be derived from the application of scientific research, when applied to the study of practical agriculture, were at once made evident.

A NEW ERA IN AGRICULTURE.

The year 1851 dates the beginning of a new era in the history of farming, for it was then that the first Agricultural Experiment Station was established in Germany. When this station was organized and began its operations in some rooms in a farm house at Mœckern, in the little kingdom of Saxony, it was the first effort made by a society of farmers, to undertake for themselves the scientific investigation of questions pertaining to their calling. By evincing their own earnestness and willingness to contribute to its endorsement, they readily secured for its support the aid of their government.

Within two years another Saxon constituency put in operation a second station, in the town of Chemnitz. The good work rapidly spread until to-day there have been founded and equipped something like one hundred and thirty of these Agricultural Experimental Stations, in the different countries of Europe. As we have seen the first Government Station was founded in Germany; to-day that nation has over eighty stations in successful operation.

What more convincing proof do we need of their importance and value? The Agricultural Experiment Station is no longer regarded as an expensive luxury, but a necessity. It is stimulating thought—developing a faculty of close and careful observation, and is indispensable as a means of agricultural education.

The following will give some idea of the scope and nature of the investigations carried on at the different European Stations:

(1). The control of the manufacture and sale of commercial fertilizers.

(2). The control of the trade in seeds, concentrated fodders, etc. (3). Experiments in the cultivation of various crops—the application of manures, etc. (4). Feeding experiments, and tests of different methods of treatment of animals, both in health and disease. (5). The physiological examination of plants. (6). Examinations and investigations of soils. (7). Experiments in grape culture and wine making. (8). Investigation of the diseases of plants and their insect enemies. (9). Experiments relating to the dairy. (10). Propagation and preservation of forests. (11). Cultivation and improvement of fruit. (12). Experiments in reclaiming waste lands. (13). Silk culture and manufactures relating to the sugar industry. (15.) Experiments in the manufacture of beer and other spirituous liquors. This will fairly represent the various lines of experimental work that are being carried on at the different stations. At each one there are from one to five trained investigators, who devote their whole time and attention to the solution of the many problems under the different heads above mentioned.

The directors and investigators connected with these stations, together with others interested in the promotion of agriculture, meet in annual Convention for discussion and exchange of views. They began also, in 1859, the publication of a journal, called the *Versuchs Stationen*, which is issued in monthly parts, and contains the results of the many important investigations carried on.

At a farmers' meeting, in Frankfort, Germany, the following resolution was passed, which resulted in the establishment of an experiment station at Darmstadt:

> *Resolved*, That we respectfully request the establishment of a station which, first above all things, shall exercise a real, practical control over the sale of manures, over the sale of feeding stuff, and the sale of seeds. At the same time, the station shall be a place to which all agriculturists may direct their questions, and receive explanations and advice on all subjects which come up in their daily experience in the field; where they can obtain counsel and be guided by the light and the results of the most recent achievements of science. This station shall also institute any practical experiments which may be necessary to solve questions of general agricultural interest and value.

This resolution is quoted because it clearly expresses the importance and need of such institutions to the farmers of Germany generally. That they recognize this need is at once seen in the rapid multiplication of stations. It is said by men of good authority who have travelled in Germany, that the advancement and the growing prosperity of the farmers in the vicinity of these stations are very apparent. They have acquired a genuine respect for science, and a large faith in fixed principles. They have received a mental awakening, and have grasped some new, definite, fundamental principles. The Experiment Stations are teaching farmers the scientific method of observation and investigation; the scientific method of looking at truth. The experiments that are being conducted constitute the frame-work of a system of facts in our agriculture—a frame-work that touches solid bottom, which we feel and know to be a sure foundation.

The European stations are supported in different ways. Nearly all derive a large part of their income from government appropriations; some are partially sustained by fees derived from analyses for private parties; others receive more or less aid from agricultural societies. The expenses vary from two to ten thousand dollars per year. Experience has shown that a useful station can be started for about six thousand dollars, and that it requires from three to five thousand dollars per year to carry on the work satisfactorily thereafter. The cost of establishing and maintaining such stations in this country is considerably more than in continental Europe, the expense necessarily depending upon the kind and amount of work that is required.

EXPERIMENT STATIONS IN THE UNITED STATES.

There are in the United States at the present time six Agricultural Experiment Stations supported by state aid. The States of Connecticut, North Carolina, New Jersey, New York, Ohio, and Massachusetts each have one, established in the order named.

The State of Connecticut was the pioneer in this work, and the first step toward the establishment of an agricultural experiment station in this country was taken at the annual meeting of the Connecticut State Board of Agriculture, held at Meriden, in the month of December, 1873. At this convention a committee, appointed for the purpose, reported as follows: "It is our unanimous opinion that the State of Connecticut ought to have an experiment station as good as can be found anywhere, and we are of the opinion that the Legislature of the State ought to furnish the means for its immediate establishment and for carrying it forward. We recommend that a permanent committee be appointed by this convention to do such work as is necessary to bring this matter before the people and before the Legislature, and to accomplish the desired result, either by direct legislative action, or by whatever means may be necessary to effect it, this committee to begin now and to continue until the work is done." The committee appointed, in accordance with the above recommendation, presented the subject of an experiment station at various farmers' meetings held in different parts of the State. The importance of the project was generally recognized, and numerous petitions in its behalf were sent to the Legislature. A bill providing for an annual appropriation of eight thousand dollars for the establishment and maintenance of a station was introduced, but was referred to the Legislature of 1875, where it also failed to become a law. Then it was that Orange Judd, the well-known publisher, came forward with the following generous offer, viz.: The free use of the ample laboratories and other appliances of the Wesleyan University, at Middletown, of which he was a trustee, together with one thousand dollars as a personal gift; provided the Legislature would appropriate two thousand eight hundred dollars per annum to carry on the appropriate work of an agricultural experiment station.

In response to this offer a bill was introduced, and passed the assembly by an almost unanimous vote, granting the appropriation called for. The organization of the station was not long delayed. Prof. W. O. Atwater was appointed Director, efficient assistants were secured, and at the beginning of the year 1876 the work of the station was successfully inaugurated. So valuable was the work done by the station, that in 1877 when a bill was presented appropriating five thousand dollars per annum, permanently and unconditionally, "to promote agriculture by scientific investigation and experiment," it passed both branches of the Legislature without any opposition. Soon after the passage of this bill the station was removed from Middletown and located at New Haven. Since then, under the efficient direction of Prof. S. W. Johnson, of the Sheffield Scientific School of Yale College, the work of the Connecticut Agricultural Experiment Station has gone on without interruption, and has been of great service to the farmers of that State. Up to the present time the work of the station has been confined strictly to investigations made in the chemical laboratory, no field or feeding experiments having been attempted.

By an act of the last General Assembly, the annual appropriation was increased from five thousand dollars to eight thousand dollars, and twenty-five thousand dollars were appropriated for the purchase of land, buildings, and equipment. The station now owns about five acres of land, with ample laboratories, and dwelling-house.

It has published, since its organization, five annual reports and seventy-two bulletins.

NORTH CAROLINA EXPERIMENT STATION.

This station was established in 1877. It is under the management and receives its support, in accordance with an act of the Legislature, from the State Board of Agriculture. It was first located at Chapel Hill, the seat of the North Carolina University, and Dr. A. R. Ledoux was appointed Director. About one year ago the station was removed to Raleigh, where it enjoys ample accommodations and admirable equipment in the new building of the State Agricultural Department. Dr. Ledoux having resigned his position as Director just before the removal of the station from Chapel Hill, Dr. Charles W. Dobney, Jr., was appointed his successor.

The work of the North Carolina Station, like that of Connecticut, has been confined almost exclusively to chemical investigations in the laboratory; no field tests or feeding experiments have been made. During the first year of the station there were made one hundred and thirty-two analyses; during the second year two hundred and thirty; during the third year the number had increased to five hundred and sixteen. The analyses were mainly of fertilizers, soils, minerals and ores.

The station has published three annual reports and various pamphlets and bulletins.

THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION.

This station was established by act of the State Legislature, in 1880. It is located at New Brunswick, where, in connection with the State Agricultural College, it has special facilities for carrying on work appropriate to an Experiment Station. Prof. G. H. Cook is Director. Up to date the station has published two annual reports and about twenty-five bulletins.

Besides investigations in the laboratory the station has conducted some careful field tests and feeding experiments. The annual appropriation for its support is $8,000.

THE NEW YORK AGRICULTURAL EXPERIMENT STATION.

This station was incorporated by an act of the State Legislature, passed during the session of 1881. After considerable delay, a farm of 125 acres, with suitable buildings, located near Geneva, N. Y., was purchased. Dr. E. Lewis Sturtevant was appointed Director and assumed the duties of his position March 1st, 1882.

The station is well equipped, and has been most generously aided by the State. The sum of $25,000 was appropriated for the purchase of the farm and buildings, and $40,000 for carrying on the work for two years. To date the station has issued thirty bulletins.

THE OHIO AGRICULTURAL EXPERIMENT STATION.

Next in order of establishment comes the Ohio Station, which was organized in April, 1882, and located at the Ohio State University in Columbus. A more extended historical sketch of this station will be found in another place.

THE MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION.

The last Station established by act of State Legislature is that of Massachusetts, the bill incorporating it going into effect July 1st, 1882. This station is to be located on the grounds of the Massachusetts Agricultural College at Amherst, but at this time of writing the organization is not completed, and the officers are not yet appointed. The station receives from the State $8,000 the first year and $5,000 annually thereafter.

SKETCH OF THE OHIO AGRICULTURAL EXPERIMENT STATION.

ESTABLISHMENT.

The Ohio Experiment Station has the following history: In response to a demand made by the intelligent farmers of the State, Col. J. H. Brigham, Master of the Ohio State Grange, and Senator from the 33d Assembly district, introduced the following bill for its establishment:

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That for the benefit of the interests of practical and scientific agriculture, and for the development of the vast agricultural resources of the State, an Ohio Agricultural Experiment Station is established as hereinafter provided.

SEC. 2. The location, control, and general management of the experiment station shall be committed to a board of control, which shall consist of five members, whose term of office shall be one year, and until their successors shall be duly elected and qualified. The Governor of the State, and the person appointed as hereinafter provided, to be the director of the station, shall be the ex-officio members of the board of control. In order to effect the immediate establishment of the station on the passage of this bill, the Governor shall appoint three members of the board of control, who shall serve for one year, and until their successors shall be duly appointed and qualified.

SEC. 3. The board of control shall be called together by the Governor at as early a date as practicable, and shall organize by the election of a president, secretary, and treasurer, who shall hold their offices until their successors are elected. Three members shall constitute a quorum.

SEC. 4. The board of control shall hold an annual meeting at the date of the annual meeting of the State Board of Agriculture in January, and other meetings at the call of the president, at such times and places as shall best promote the objects of the station.

SEC. 5. The board of control shall locate said station, and shall appoint a competent director, who shall have the general management and oversight of the experiments and investigations necessary to carry out the objects of the station. The said board shall also make such rules, by-laws, and regulations for the government of the station and its work, and for carrying out the business and purposes of the station, as shall be necessary and proper in their judgment. It shall also make an annual report of its experiments and work to the Governor of the State, and the same shall be published annually in the Ohio agricultural report, and five thousand copies separate in pamphlet form for free distribution, and the pamphlet copies to be printed and paid for the same as other public printing.

SEC. 6. The director's salary shall be fixed by law in proportion to the services required and performed. The members of the board of control shall be paid their actual expenses incurred while on duty, but no compensation for time or services.

SEC. 7. This bill shall take effect immediately on its passage.

ORGANIZATION.

This bill was passed April 17, 1882. A few days thereafter, Gov. Charles Foster, in accordance with its provisions, appointed three members of the Board of Control. These appointments were as follows: W. I. Chamberlain, representing the State Board of Agriculture; Nicholas Ohmer, representing the State Horticultural Society; and Emmett Mix, representing the State Grange.

These members of the Board of Control were called together April 25th, and affected an organization by the election of the proper officers, and the appointment of Prof. W. R. Lazenby as Director. The Trustees of the Ohio State University, at Columbus, having offered the free use of so much land as might be needed for field experiments, the use of laboratories, apparatus, collections, implements, etc., necessary to carry on the appropriate work, the Station was located at the University.

INITIAL WORK.

Realizing that the enterprise was solely for the benefit of the farmers of the State, the Director, by the advice of the Board of Control, prepared a brief circular of information, which concisely stated the object of the Station, the work that it was prepared to do, and the privileges it offered.

Before planning any definite series of field experiments, the Director wrote to many representative farmers in different sections of the State, asking for advice and suggestions; the object being to find out as nearly as possible what the farmers of Ohio most needed to know. Nearly all of the letters thus sent out were promptly answered; and whatever measure of success has been attained, is largely due to the wise counsels given, and the kindly interest shown by the practical farmers of the State.

Among the most important tests and investigations made by the Station during the eight months of its existence may be mentioned the following, a detailed statement of which will be found elsewhere in this Report.

FIELD TESTS WITH WHEAT AND CORN.

Knowing the importance of these cereals in the agriculture of Ohio, the wide area of the State over which they are cultivated, and the fact that their aggregate value exceeds that of all other farm crops taken together, a special series of field experiments were inaugurated with these two staple products. For several years past, carefully planned experiments in wheat culture have been conducted upon the farm of the Ohio State University; and one year ago last fall, long before the Station was established, a collection of over eighty varieties of winter wheat was sown in small plots. This was taken in hand by the Station, and some careful observations and tests, regarding the habits, manner of growth, and comparative merits of the different varieties were made. Similar and more extended tests were made with different varieties of corn.

EXPERIMENTS WITH POTATOES AND GARDEN VEGETABLES.

Numerous varieties were tested, and different methods of cultivation tried. Early and tender vegetables were started in hot-beds, transplanted at the proper time, and so managed that their comparative merits could be known.

Much time was spent in experimenting with various insect remedies, studying the development of the feeding rootlets, observing the difference in the time of maturity of the essential parts of the flower, trying to originate new and improved varieties, etc. The small fruits were also the subject of painstaking observation and some carefully conducted experiments.

TESTS WITH GRASSES AND FORAGE CROPS.

Twenty-four varieties of grasses, clovers, and other soiling crops were sown last spring, upon adjoining plots, for study and comparison.

PRACTICAL FORESTRY.

Recognizing the importance of this subject, a beginning has been made in the way of raising forest-trees. Observations upon the growth and management of seedling timber trees can scarcely fail to be of interest and value to the farmers of the State.

THE SCOPE OF FIELD EXPERIMENT.

They are not confined to comparative tests of varieties or yields of definite areas, under the influence of different manures and different methods of culture. It is intended that they shall include a careful study of the quality and vigor of the seed; the growth of the root; the effect of checking growth in one direction, in order to stimulate it in others; the effects of self and cropfertilization; the best time and conditions for performing the various processes of planting, manuring, cultivating and harvesting; in short, all the important factors that influence the growth and fruitfulness of the individual plant.

LABORATORY WORK.

Up to the present time field experiments have constituted only a small part of the work of the Station. The examination of seeds, with reference to their purity and vitality; the examination and identification of grasses, weeds, and other plants; the study of injurious insects; the collection of weed-seeds; the keeping of careful meteorological records, etc., have occupied much time and attention.

CORRESPONDENCE.

A large number of letters have been written in reply to inquiries. There have been questions about insects, weeds, grains, fruits, flowers, vegetables, farm implements; inquiries concerning the use and value of fertilizers, and various other subjects of agricultural practice. All these communications have received careful consideration and prompt answers.

STATION PUBLICATIONS.

It has been thought best, by the Board of Control, that no bulletins be issued during the inaugural year, and that the detailed results of the work of the Station first appear in the annual report. Hereafter, weekly bulletins will be issued, which will be simultaneously sent to the different Ohio newspapers, and to a number of agricultural journals in other States.

It is hoped that these bulletins will serve as a valuable means of communication between the Station and all those interested in its work.

The Experiment Station will not be accomplishing its true mission until every farmer in the State is able to find ready means of promptly learning just what it is doing.

RELATION OF THE STATION TO THE STATE UNIVERSITY.

Very wisely the Board of Control, to whom was committed the location and general management of the Station, located it at the State University, where the work is now being carried on upon the following conditions, viz.:

1. The Station has been given the free use of a field of seventeen acres, lying south of the University Campus, which is already plotted, and will soon be devoted wholly to experimental purposes.
2. The Station has the privilege of conducting such experiments upon the University farm, and in the fruit and vegetable gardens, as may be mutually agreed upon by the Board of Control and the Professors in charge of the same.
3. The Station has been granted the free use of a team, and such implements and tools belonging to the University as is needful in the execution of its work.
4. The Station agrees to turn over to the University, for the use of team, implements, etc., all products raised, except what is needed for seed, museum purposes, and the like.
5. The Station is given rooms in the Agricultural Chemistry Department of the new Chemical Laboratory for storing samples of seed, fertilizers, etc.; for making weights, conducting experiments in germination, and work of a similar character.

The Board of Control of the Station also agrees to pay a fair proportion, according to the work done, of the salary of a competent Agricultural Chemist, who may be employed by the University to teach this important branch of Chemistry.

In this connection the Director, in behalf of the Board of Control, desires to acknowledge the obligation the Station is under to the authorities of the University for their substantial aid and encouragement. With the small appropriation at command, the Station could have accomplished nothing without the University. By a union of the means and efforts of both institutions, results have been secured that either alone could not have attained.

PRESENT EQUIPMENT OF THE STATION.

In its present organization the head-quarters of the Station consists of two apartments in the new Chemical Building of the State University. The larger room is used as a seed-laboratory, weighing and storage room. The other is its office and writing-room. Its property consists of various collections of illustrative material, microscopes, seed-testers, weighing apparatus, and the simplest office furniture, together with the necessary requisites for keeping records, etc. The Station owns no chemical apparatus, and for this is dependent upon the State University. It owns no books, except its own records, and a few copies of agricultural reports and transactions.

EXPERIMENTS WITH WHEAT.

For several years carefully planned and well executed experiments in wheat culture have been conducted at the Ohio State University, by Mr. C. E. Thorne, under the direction of Prof. N. S. Townshend. In the Fall of 1881 an effort was made to supplement this work by collecting a larger number of varieties for the purpose of making new and a somewhat different series of tests and observations. Between Oct. 1st and 3d, about eighty varieties of winter wheat were sown. The greater part of these in plots six feet square. Of some sorts we were able to procure only a few grains and on account of the difference in the amount of seed used we were unable to make any accurate comparison of the yield of all the different varieties per acre.

Treated as they were, alike in every respect, except in the size of the plot, we were able to make careful notes of their habits of growth, time of ripening, strength of straw, size of head, relative yield and quality of grain, etc. The following table gives some of the results of the tests made:

Varieties.	Date when harvested.		Height in feet and inches.		Length of head in inches.	Smooth or bearded.	Size and color of grain.
			ft.	*in.*			
Alabama	July	7	4	9	2.5	B	Small—R.
American White	“	7	4	10	3.0	B	Large—W.
Arnold's Gold Medal,	“	7	4	7	2.9	S	Small—W.
Arnold's Victor	“	11	5	2	2.6	S	Medium—W.
Australian	“	10	5	5	3.0	....	Large.
Bennett	“	11	5	5	....	S	Small—R.
Big May	“	7	5	8	2.3	S	Medium—R.
Big Frame	“	7	4	10	3.3	S	Small—R.
Blue Stem	“	11	4	10	2.8	S	“ R.
Centennial Black Beard	“	10	5	9	2.8	B	Large—W.
California Blue Stem	“	7	4	8	2.5	B	“ R.
Champion Amber	“	7	4	9	2.6	S	Medium—R.
Clawson	“	7	5	1	2.9	S	Large—W.
Crow Red	“	11	4	10	2.6	....	Medium.
Early May	“	11	5	6	2.6	S	Medium—R.
Egyptian	“	7	5	2	2.9	B	“ R.
Emporium Scott	“	7	4	7	2.7	B	“ R.
Finley	“	7	5	0	2.6	S	“ R.
Fultz	“	7	4	6	2.6	S	“ R.
German Amber	“	7	4	10	3.1	B	“ R.
Golden Straw	“	7	4	5	2.5	S	Small—W.
Golden Drop	“	7	5	0	2.9	....	Medium.
Grecian	“	7	5	2	2.6	S	Large—W.
Heiges Prolific	“	7	4	6	2.9	S	Small—R.
Hungarian White Chaff	“	7	4	8	2.6	B	“ R.
Lancaster	“	7	5	0	2.6	B	Large—R.
Lincoln	“	7	5	5	3.5	B	Medium—R.
Mammoth Red	“	7	4	8	3.4	S	“ R.
McGhees' Red	“	7	4	9	3.3	S	“ R.
Mediterranean	“	7	5	0	2.9	B	Large—R.
Mich. Amber	“	7	5	4	2.5	B	Small—R.
New Zealand	“	10	5	1	3.3	S	Large—W.
Palestine	“	7	5	0	2.9	....	Small.
Powers	“	10	4	11	3.0	....	“
Prolific	“	7	5	0	3.4	....	Medium.
Prossoe	“	10	5	4	3.1	S	Medium—R.
Red Clawson	“	7	4	9	2.3	B	Small—R.
Red Chaff	“	7	4	9	2.4	S	“ R.
Red Amber	“	7	4	9	2.8	B	Large—R.
Rickenbrode	“	11	5	0	2.6	S	“ W.
Rice	“	7	5	6	2.4	B	Medium—R.
Rocky Mountain	“	7	4	8	2.5	S	Small—R.
Roscoe	“	7	4	8	2.3	S	“ W.
Russian, No. 2	“	7	4	8	2.3	S	“ W.
Sandomirka	“	7	5	5	2.9	S	“ W.
Scott's Smooth	“	7	....		3.1	S	Medium—R.
Scott's Bearded	“	7	4	10	2.9	B	Large—R.
Silver Chaff	“	7	4	10	2.9	S	Medium—W.
Siberian	“	10	4	9	3.3	S	Small—R.
Small Frame	“	7	4	2	3.0	S	“ R.
Smith's Improved	“	10	5	1	2.8	B	Large—W.
Swamp	“	7	4	1	2.5	B	“ R.
Tappahannock	“	7	4	8	2.5	S	Small—W.
Theiss	“	7	4	7	2.4	B	Medium—R.
Travis Centennial	“	11	5	0	2.8	S	“ R.
Turkey	“	11	4	8	2.6	....	Small.
Treadwell	“	7	5	2	3.0	B	Medium—W.
Velvet Chaff	“	7	4	8	2.9	B	“ R.
Washington Glass	“	7	5	5	3.0	S	Large—W.
White Eldorado	“	7	4	10	2.8	S	Medium—W.
Yellow Blue Stem	“	7	5	3	2.8	S	“ R.
Zimmerman	“	7	4	1	2.9	S	“ R.

Varieties.	No. of kernels found in separate heads.		Average No. of kernels in ten heads.	No. of kernels in one cubic inch.	No. of kernels in one measured bushel.	Weight of measured bushel in pounds.
	Minimum.	Maximum.				
						lbs.
Alabama	23	32	25.7	426	916,070	63.2
American White	31	41	31.9	320	688,128	61.1
Arnold's Gold Medal	28	42	35.3	432	928,973	61.4
Arnold's Victor	20	27	24.3	376	808,550	59.0
Anstralian	34	46	40.1	323	694,579	60.7
Bennett	25	37	29.2	460	989,184	....
Big May	24	30	26.6	399	858,010	63.4
Big Frame	39	45	40.5	485	1,042,944	62.1
Blue Stem	27	32	30.3	488	1,049,395	60.3
Centennial Black Beard	36	54	45.6	285	612,864	56.1
California Blue Stem	17	28	21.3	326	701,030	61.0
Champion Amber	29	43	37.3	373	802,099	59.8
Clawson	23	31	26.7	323	694,579	58.6
Crow Red	23	41	30.3	388	834,355	61.5
Early May	25	34	26.9	391	840,806	65.0
Egyptian	28	45	33.7	330	709,632	63.4
Emporium Scott	16	29	24.0	425	913,920	70.0
Finley	26	38	33.9	370	795,648	62.0
Fultz	30	41	35.3	393	845,107	61.6
German Amber	27	44	38.7	342	735,437	62.4
Golden Straw	32	43	32.2	570	1,225,728	62.6
Golden Drop	25	42	32.6	376	808,550	62.5
Grecian	23	41	30.3	330	709,632	62.4
Heiges Prolific	21	35	30.1	460	989,184	63.4
Hungarian White Chaff	30	41	36.9	447	961,229	59.8
Lancaster	22	29	23.5	330	709,632	62.2
Lincoln	27	31	29.0	350	752,640	58.7
Mammoth Red	16	26	21.3	347	746,189	59.6
McGhees Red	28	36	30.0	390	838,656	59.3
Mediterranean	21	37	28.3	303	651,571	63.4
Mich. Amber	24	43	31.2	465	999,936	62.4
New Zealand	28	43	37.1	324	696,730	58.1
Palestine	20	32	25.6	429	922,522	61.0
Powers	36	58	44.4	419	901,018	59.7
Prolific	19	32	25.7	382	821,453	62.8
Prossoe	23	44	37.7	377	810,701	58.0
Red Clawson	19	28	24.4	474	1,019,290	65.8
Red Chaff	25	32	27.9	476	1,023,590	64.2
Red Amber	17	26	21.9	304	653,721	64.1
Rickenbrode	28	43	28.5	375	806,400	57.7
Rice	26	40	32.4	392	842,957	62.1
Rocky Mountain	22	40	32.1	427	918,221	64.2
Roscoe	30	43	36.9	567	1,219,277	59.5
Russian, No. 2	25	33	28.8	410	881,664	63.4
Sandomirka	19	37	25.7	402	864,461	62.9
Scott's Smooth	23	30	28.7	360	774,144	63.8
Scott's Bearded	23	47	30.7	307	660,173	61.2
Silver Chaff	20	45	26.6	340	731,136	65.2
Siberian	23	38	28.2	475	1,021,440	61.0
Small Frame	30	40	35.0	428	920,371	62.4
Smith's Improved	24	47	27.4	335	720,384	61.6
Swamp	16	29	23.4	307	660,173	61.0
Tappahanock	22	32	25.5	435	935,424	62.8
Theiss	19	41	29.4	381	819,302	63.0
Travis Centennial	26	38	29.2	367	789,197	62.3
Treadwell	21	33	25.9	349	750,490	61.1
Turkey	25	41	31.1	486	1,045,094	61.2
Velvet Chaff	25	38	29.3	272	789,949	63.9
Washington Glass	21	39	29.8	336	722,534	64.2
White Eldorado	27	39	29.3	353	759,091	60.6
Yellow Blue Stem	25	45	28.4	390	838,656	61.7
Zimmerman	34	43	38.	561	1,206,374	60.8

EXPLANATORY NOTES.

In the foregoing tables the abreviations used are as follows: R., red; W., white; B., bearded; S., smooth.

We have omitted from the list nearly all varieties known simply by numbers, and others that came to the Station under different names, but which, upon trial, proved to be identical with some of the varieties named.

Some of the varieties mentioned are known by different names in different localities, while the same name is not unfrequently given to entirely distinct varieties. One object, in raising all the different sorts that can be obtained, is to find out, if possible, just how many distinct varieties there are. There is no doubt that the same variety, grown under different conditions of soil and climate, sometimes presents far greater variation than do different varieties grown under the same condition.

Varieties coming from different localities, when grown at the same place, often appear quite distinct for one or two years, after which some of them may become so much like others that it is impossible to distinguish them. One change is particularly noticeable. Nearly all white wheats, coming from latitudes north of Columbus, have a tendency, when grown here, to become darker in color.

Great confusion arises from the fact that a number of the best known and largely cultivated varieties are called by different names in different parts of the country. For example, Mediteranean is known in many places as Blue Stem, in other localities as Lancaster; Zimmerman is known as Democrat; Clawson, as Seneca, etc. This list of synonyms might be greatly extended. It is hoped, that a few years of careful comparative tests will bring order out of this confusion.

The measurements of height recorded refer to the total length of stem. A collection of the best stools of each variety were made for the museum, and the specimens thus selected and straightened were measured. The length of heads given is an average of ten, selected so as to fairly represent each variety.

Ten average heads were selected from each variety, for the purpose of ascertaining the number of kernels in each head. Five heads were counted separately; the other five were shelled together, and the average taken. The table shows the largest and the smallest number in the five heads, and the average in ten.

A measure of just one cubic inch capacity was filled with the grains of each variety, and these were accurately counted. Multiplying by the number of cubic inches in a bushel, gave the number of kernels in a bushel.

Multiplying the weight of the grains in a cubic inch by the number of cubic inches in a bushel, gave the weight per bushel.

The following table exhibits the results of tests with varieties, made at the

Ohio State University during the years 1880, 1881 and 1882. While it cannot be claimed that these figures give the exact comparative values of the different varieties named, yet, as they were all exposed to similar conditions, favorable and unfavorable, they doubtless give very nearly the comparative value as to productiveness and weight of grain:

Varieties	Yield of bushel per acre.			Weight of grain per bushel.	
	1880.	1881.	1882.	1881.	1882.
American White	......	19	21	59½	59½
Arnold's Gold Medal	31	19½	27	60	56
Bennett	......	......	28½	......	62
Champion Amber	......	23	21	57½	56
Clawson	26	23	27	59	57
California Blue Stem	......	......	24	......	59
Egyptian	......	22	27	59	59½
Finley	......	......	22½	......	58½
Fultz	27	21½	19½	61	61
German Amber	......	24½	21	62½	57
Golden Straw	28	19½	19½	60½	62
Grecian	......	20	24	58½	59½
Heighe's Prolific	......	19	21	61½	59
Hungarian	......	21	28½	62	59½
Indiana Swamp	......	23½	27	61	58
Lancaster	......	23½	27	57	60
Mammoth Red	......	12½	27	57½	60
McGhee's Red	......	26	25½	62	58
Mediterranean	......	21½	27	59	59½
Michigan Amber	......	21½	24	50½	59
New Zealand	......	......	27	......	56
Red Amber	......	25½	22½	61	59½
Rice	......	......	27	......	58
Rickenbrode	......	19½	10½	58½	59½
Russian, No. 2	......	17	30	62½	62
Russian May	......	......	28½	......	62½
Sandomirka	30	26½	28½	63	63
Scott	......	26½	25½	61½	61
Siberian	......	15	15	57	56
Silver Chaff	33	26	28½	59½	62½
Smith's Scall	......	......	22½	......	57½
Smith's Improved	......	16½	21	59½	60
Tappahannock	......	16½	24	61	63
Theiss	......	25	16½	62½	59
Travis	......	......	18½	......	60
Treadwell	......	19½	25½	59	59
Velvet Chaff	28	22½	27	64	64½
Washington Glass	......	......	27	......	56
White Eldorado	......	......	21	......	58
White Blue Stem	......	......	22½	......	57½
White Glass	......	......	27	......	58
Yellow Blue Stem	......	......	21	......	60
Yellow Missouri	......	12	16½	57½	57
York White Chaff	......	26	21	59	61
Zimmerman	......	26	30	61	58½

NOTES.—As will be seen from the table, only a few varieties were tested in 1880, and the weights are not given.

Yellow Missouri was tried in 1880, but proved a failure. Clawson, Fultz and Velvet Chaff were grown for several years prior to 1880, yielding uniformly good crops.

From the foregoing tables are made the following interesting averages:

I.

AVERAGE YIELD AND WEIGHT OF THE RED WHEATS, AS COMPARED WITH THE WHITE WHEATS.

	Average yield.		Average weight.	
	1881.	1882.	1881.	1882.
Red	21 3-5 bush.	24 1-10 bush.	60⅛ lbs.	57⅞ lbs.
White	20 4-5 "	24⅝ "	60 "	59½ "

II.

AVERAGE YIELD AND WEIGHT OF THE SMOOTH WHEATS, COMPARED WITH THE BEARDED WHEATS.

	Average yield.		Average weight.	
	1881.	1882.	1881.	1882.
Smooth	20 1-5 bush.	23 3-6 bush.	59¾ lbs.	59 1-5 lbs.
Bearded	22½ "	24 7-12 "	60¾ "	59½ "

BRIEF NOTES DESCRIPTIVE OF STANDARD VARIETIES.

Clawson.—This variety has been grown for several years upon the farm of the Ohio State University. Although, it continues to yield fairly good crops, it shows some signs of deterioration. It has a tendency to lodge, and the straw is very brittle when ripe. The grain is frequently more or less shrunken.

Among its qualities are hardiness, and a freedom from rust and smut: although less productive than some other varieties it is still worthy of cultivation.

Fultz.—This variety is sometimes called the Red Clawson. Few sorts cultivated in Ohio have given uniformly better results; it is early, has large heads, and strong straw of medium height. For the past two or three years it has shown a tendency to rust, and is also affected more or less with smut. It is the leading variety in many parts of the State.

It appears to do better, in comparison with other varieties, upon high grounds and light soils than on bottom lands or heavy clays.

Silver Chaff.— This is now quite widely disseminated throughout the State, and, under favorable conditions, is one of the most productive varieties. It is a white, bald wheat, with a rather coarse straw of medium strength. It is not troubled with rust, ripens a few days later than the Fultz, about the same time as the Clawson.

Velvet Chaff.—This variety continues to grow in popular favor. Although less productive than some other kinds it maintains a good average. It has rather short, but well filled heads; straw erect and moderately strong. It is sometimes troubled with smut, though not often seriously affected. Like nearly all red, bearded varieties, it is very hardy; good to sow in exposed situations. It ripens about the time, or a little earlier than the Fultz. Its milling qualities are good.

Arnold's Gold Medal.—A bald, white wheat, with large compact heads; somewhat variable as to yield and quality of grain. Very productive under favorable conditions. It ripens late, and shatters badly, unless promptly harvested; was formerly much prized by millers, but is not now so highly regarded.

Golden Straw.—A red wheat, which ripens early, and is fairly productive. The heads are bald, small, but compact, and well filled. Grains of small size, usually plump. Straw short, of medium strength, not perfectly hard, and often suffers from winter killing; is worthy of trial, but should be experimented with carefully.

Mediterranean.—An old standard sort. Heads rather small, loose, and heavily bearded; not very productive but sure. Straw tall, rather weak, and inclined to lodge on rich ground. Yield and quality of grain quite variable. One of the hardiest varieties, but is being rapidly superseded by more productive sorts. Its milling qualities are good.

Lancaster.—A variety resembling the Mediterranean, but more productive. Heads large, and usually well filled. Straw long and rather weak, not much troubled with rust; milling qualities, excellent.

Zimmerman.— A smooth, red wheat, ripening early. Heads rather small, compact, and well-filled. Straw short and strong; it is somewhat variable as to yield. Here, in Central Ohio, it is among the more productive sorts. It is a variety worthy of trial, and worthy of a systematic effort to improve it. Its milling qualities are unsurpassed.

Sandomirka.—A bald wheat with white grains and red chaff; introduced from Poland. Heads medium size, compact. Straw long and stout, inclined to rust. It ripens late; one of our most productive varieties; not perfectly hardy, though it usually stands the winters well in Central Ohio.

Rickenbrode.—A white wheat. Smooth, rather short, compact heads. Straw medium length and strong. Quite variable as to yield; does not appear to be a very profitable variety for Central Ohio. There are good reports from it from Michigan and elsewhere. It is liked by millers.

German Amber.—A variety worthy of more extended cultivation. It is a bald wheat, with large compact heads. Grains large, plump and heavy. Straw rather tall and weak. Yield uniformly good; ripens with the earliest; inclined to rust.

Heige's Prolific.—This variety has only given a moderate yield, but should be tested farther. It is a red wheat. Heads smooth, large and compact. Straw moderately tall and strong. It ripens early. Grain rather small, but plump and heavy.

Theiss.—A red, bearded wheat. Heads variable in size. Straw of medium length, and rather weak. Yield and quality of grain variable. Winter kills badly at times. Should be experimented with cautiously.

York White Chaff.—A very promising variety of white wheat for the western States. It is bald. Heads large, quite compact, and well filled. Quality of grain excellent; yield usually large. Straw tall and long: but little tendency to rust. Milling qualities reported as pretty good.

Rice.—A smooth, white wheat. Heads rather large and compact. Kernels medium sized and heavy. Straw very tall, weak, and much inclined to lodge; slightly rusted. Probably of less value than many others, but worthy of a thorough trial.

McGhee's Red.—A bald, red variety, very productive. Heads large and fairly well-filled. Straw of medium height, and rather weak; somewhat rusted. A very productive wheat of good milling qualities: well worthy of an extended trial in Ohio.

Tappahanock.—A white wheat; moderately productive. Heads smooth and and rather small. Kernels small, but hard. Milling qualities excellent. Straw of medium length, and not very strong; inclined to rust. Yield variable. Of doubtful value.

Treadwell.—A white wheat of uncertain value. Heads about medium size, not bearded. Kernels large and of good weight. Straw of good height and strong. Milling qualities good.

Smith's Improved.—A bearded, red wheat; moderately productive. Heads of fair size and compact. Straw tall and of medium strength; apparently hardy, with no tendency to rust.

Russian, No. 2.—A smooth, white wheat. Heads large and compact. Straw short and strong; inclined to rust. Kernels good size and heavy. Excellent milling qualities. Ripens early, and is proving a valuable wheat in Ohio.

Red Amber.—A red wheat, with large bearded heads. Straw tall and moderately strong; no rust. Kernels large, plump and heavy. Good milling qualities. A reliable and profitable variety.

Champion Amber.—A red wheat with smaller heads than the preceding. Straw medium length and quite strong. A productive variety, distinguished by its short, compact heads.

Finley.—A red wheat, slightly bearded. Heads small and not very compact. Straw medium height and strong. Only moderately productive; should be tested further.

GENERAL STATISTICS RELATING TO THE WHEAT CROP.

The following tables have been compiled from various sources, with the view of supplying those interested in the production of wheat with some facts that can scarcely fail to be of interest and profit. The figures have been taken from the Reports of the Department of Agriculture, the Ohio Agricultural Reports, and the United States Census Report.

Indebtedness to Prof. P. Schweitzer, of the Missouri State University is also acknowledged, whose carefully prepared statistics have furnished valuable information.

I.

TOTAL PRODUCTION, VALUE AND AREA OF THE WHEAT CROP OF THE UNITED STATES, WITH SOME DETAILS.

Year.	Bushels.	Dollars.	Acres.	Value per bu., cents.	Value per acre, dollars.	Yield per acre, bushels.
1880	480,849,723	$460,597,000	36,037,000	95.8	$12.74	13.3
1879	448,756,600	497,030,100	32,545,950	110.8	15.27	13.8
1878	420,122,400	326,346,424	32,108,560	77.2	10.16	13.1
1877	364,194,146	394,695,779	26,277,548	108.2	15.08	19.9
1876	289,356,500	300,259,300	27,627,021	103.7	10.86	10.4
1875	292,136,000	294,580,990	26,381,512	100.0	11.16	11.0
1874	308,102,700	291,107,895	24,967,027	94.4	11.66	12.3
1873	281,254,700	323,594,805	22,171,676	115.0	14.59	12.7
1872	249,997,100	310,180,375	20,858,359	124.0	14.87	11.9
1871	230,722,400	290,411,820	19,943,893	125.8	14.56	11.5
1870	235,884,700	245,865,045	18,992,591	104.2	12.94	12.4
1869	260,146,900	244,924,120	19,181,004	94.1	12.76	13.5
1868	224,036,600	319,195,290	18,460,132	142.4	17.29	12.1
1867	221,441,400	421,796,460	18,321,561	198.5	23.02	11.5
1866	151,990,906	333,773,646	15,424,496	206.4	21.64	10.0
1865	148,522,827	217,330,195	12,304,894	146.3	17.66	12.1
1864	160,695,823	294,215,119	13,158,089	183.2	22.37	12.2
1863	173,677,928	198,249,108	13,098,936	140.8	15.12	13.2
1862	177,957,172	166,674,311	11,115,830	93.7	14.99	16.0

2.

TOTAL EXPORT OF DOMESTIC WHEAT AND WHEAT-FLOUR IN BUSHELS AND BARRELS, AND THEIR VALUE.

Year.	Bushels.	Dollars.	Barrels.	Dollars.	Total dollars.
1881	150,575,577	$167,698,485	7,945,786	$45,047,257	$212,745,742
1880	153,252,795	190,546,305	6,011,419	35,373,197	225,919,502
1879	122,353,936	130,701,079	5,629,714	29,567,713	160,268,792
1878	72,404,961	96,872,016	3,947,333	25,095,721	121,967,737
1877	40,325,611	47,135,562	3,343,665	21,663,947	68,799,509
1876	55,073,122	68,382,899	3,935,512	24,433,470	92,816,369
1875	53,047,177	60,954,496	3,973,128	23,712,440	84,666,936
1874	71,039,928	101,421,459	4,094,094	29,258,094	130,679,553
1873	39,204,285	51,452,254	2,662,086	19,381,664	70,833,918
1872	26,423,080	38,915,060	2,514,535	17,955,684	56,870,744
1871	34,310,906	45,143,424	3,653,841	24,093,184	69,236,608
1870	36,583,115	47,171,229	3,463,333	21,169,593	68,340,822
1869	17,557,836	24,383,259	2,431,873	18,813,865	43,197;124
1868	15,940,899	30,247,632	2,076,423	20,887,798	51,135,430
1867	6,146,411	7,822,555	1,300,106	12,803,775	20,626,330
1866	5,579,103	7,842,749	2,183,050	18,396,686	26,239,435
1865	9,937,152	19,397,197	2,604,542	27,222,031	46,619,228
1864	23,681,712	31,432,133	3,557,347	25,588,249	57,020,382
1863	36,160,414	46,754,195	4,390,055	28,366,069	75,120,264
1862	37,289,572	42,573,295	4,882,033	27,534,677	70,107,972

NOTE.—The figures in this table are taken from the reports of the Chief of the Bureau of Statistics, and are for the official years ending June 30.

ANNUAL EXPORTS OF WHEAT.

From 1862 to 1872, 46,000,000, or 18 per cent. of total crop.
From 1872 to 1882, 170,000,000, or 37 per cent. of total crop.

WHEAT PRODUCTION, ACCORDING TO POPULATION IN DIFFERENT COUNTRIES.

United States (in 1880) produced	9.6	bushels	per capita.
Great Britain produces	11.9	"	"
Ireland	13.	"	"
Holland	9.	"	"
Italy	8.	"	"
Belgium	14.	"	"
Hungary	19.3	"	"
France	19.5	"	"
Prussia	22.7	"	"
Russia	23.	"	"

Much less wheat is consumed proportionally in the United States than in Europe. The immense production of corn, and large consumption of meat accounts for this fact. The amount used for food is about five bushels per capita.

Table exhibiting the estimates of the crop of six of the great western wheat States for the years 1881 and 1882.

These figures have been collected by the several State Boards of Agriculture, and by the United States Department. In some cases round numbers only are given.

It is probable that some of the estimates for 1882 are too high, but the fact remains that the crop was one of the best in our history.

	1881.	1882.
Illinois	22,000,000	52,000,000
Indiana (U. S. Department	31,353,000	47,132,048
Ohio	38,102,000	45,143,546
Minnesota (U. S. Department)	35,952,000	42,036,671
Kansas " "	19,909,000	(?) 32,000,000
Michigan	20,144,378	32,123,151
Totals	167,060,378	250,435,416 167,060,378
Surplus		82,375,038

The office of the tenth census of the United States makes the following returns, as the wheat production for 1880:

	States.	Bushels produced.
1	Illinois	51,110,502
2	Indiana	47,284,853
3	Ohio	46,014,869
4	Michigan	35,532,543
5	Minnesota	34,601,030
6	Iowa	31,154,205
7	California	29,017,707
8	Missouri	24,966,627
9	Wisconsin	24,884,689
10	Pennsylvania	19,462,405
11	Kansas	17,324,141
12	Nebraska	13,847,007
13	Kentucky	11,356,113

TABLE SHOWING THE AVERAGE YIELD OF WHEAT PER ACRE IN DIFFERENT STATES DURING THE PAST TWENTY YEARS.

States.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
Alabama					5.7	7.8	6.1	7.5	8.4
Arkansas					6.5	9.2	13.5	11.8	10.8
California	24.8						20.	18.2	19.
Connecticut	17.	15.	16.5	17.5	17.3	17.5	15.5	17.5	17.8
Delaware	15.	18.	12.	7.5	8.	9.3	12.	13.5	10.
Georgia					4.	8.	5.6	7.4	8.
Illinois	14.	12.	14.3	11.	13.	11.4	11.5	11.2	12.
Indiana	16.	14.	14.	8.5	5.9	10.5	11.2	14.4	11.
Iowa	14.	14.	12.2	14.6	16.	12.7	14.5	13.	12.5
Kansas	21.	16.	15.	15.2	21.4	14.	15.6	18.5	15.
Kentucky			10.3	7.2	6.5	8.2	8.5	11.	10.
Maine	16.	12.	10.5	13.	12.7	10.6	10.	15.4	14.8
Maryland	14.	11.	11.5	9.5	9.7	11.		11.8	9.7
Massachusetts	17.	14.	16.	17.6	14.9	16.	15.5	18.	17.6
Michigan	18.	13.	12.	15.7	13.8	12.4	12.5	15.2	14.
Minnesota	20.	14.	13.3	20.6		12.5	15.	16.3	15.2
Mississippi					5.	9.5	9.1	9.	9.7
Missouri	17.	16.	14.6	12.7	16.5	12.4	14.	14.1	13.
Nebraska			14.	18.	26.	15.	15.5	17.8	14.4
Nevada								25.	25.4
New Hampshire	15.	14.	12.5	15.8	16.2	12.1	11.7	17.5	14.8
New Jersey	19.	16.	15.	12.4	13.5	14.	13.9	16.5	12.8
New York	18.	14.	13.	15.3	15.2	14.5	14.6	16.	13.8
North Carolina					5.8	6.9	5.9	8.4	8.6
Ohio	16.	18.	10.3	8.5	4.5	11.6	13.	15.5	13.8
Oregon								19.	19.5
Pennsylvania	18.	14.	12.	12.2	11.	12.5	12.8	14.8	12.
South Carolina					4.7	6.4	5.6	6.6	7.
Tennessee					5.3	8.5	6.6	8.4	8.8
Texas					12.	9.5	6.	11.1	11.7
Vermont	16.	12.	14.	18.3	20.2	15.8	16.	18.	16.8
Virginia					6.7	8.	8.4	10.5	9.6
West Virginia			9.8			10.5	10.7	11.7	11.4
Wisconsin	17.	14.	9.5	16.8	14.5	12.3	13.	15.3	13.4

States.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Alabama	6.3	9.5	7.3	9.	8.5	6.5	7.	7.3	8.4	5.4
Arkansas	8.4	10.4	10.	10.5	12.3	8.2	9.	6.	8.	7.
California	11.	12.2	18.5	13.2	11.	13.	9.5	17.	14.	16.
Connecticut	17.	17.	18.	18.	16.	14.5	17.	13.	18.	20.
Delaware	11.5	9.2	11.	11.	13.5	16.	13.5	13.	13.	15.7
Georgia	5.	9.	7.	7.3	7.5	6.	9.5	7.	9.	6.8
Illinois	12.3	12.1	13.5	11.5	10.5	9.3	16.5	18.6	18.7	17.2
Indiana	12.	12.4	11.2	12.2	9.	11.	14.5	16.	20.8	17.3
Iowa	10.3	12.6	13.	11.6	9.7	6.1	14.5	9.	10.2	10.4
Kansas	15.9	11.6	14.	13.7	17.	14.6	18.5	16.3	11.	10.
Kentucky	6.1	12.	9.	10.6	10.	10.	12.5	9.3	14.	8.9
Maine	13.	16.	11.	15.	14.	12.	14.	14.	16.	12.8
Maryland	12.	8.5	11.3	10.7	11.	12.5	13.8	13.	14.4	14.
Massachusetts	18.2	17.4	19.	14.5	16.	18.	22.	22.	18.	17.
Michigan	14.	12.	12.2	14.2	18.5	12.	17.5	18.3	19.2	17.8
Minnesota	11.	16.5	18.3	13.4	17.	8.5	18.5	12.	12.8	14.4
Mississippi	10.	10.3	9.6	9.2	11.	7.7	8.	6.8	7.2	6.8
Missouri	13.4	8.8	12.8	13.5	9.	12.4	14.	11.	14.	14.
Nebraska	10.3	12.2	15.5	11.6	9.8	11.5	15.	18.1	11.3	8.8
Nevada	22.7	23.7	22.6	19.	19.3	18.2	18.	12.	13.	13.
New Hampshire	15.2	16.5	15.	16.	17.	15.	17.	14.	11.7	15.
New Jersey	18.	13.5	16.2	15.5	12.	13.6	13.8	15.	12.3	17.
New York	17.2	12.5	13.5	15.6	8.	15.	18.	19.	15.	17.
North Carolina	6.	8.2	6.2	8.	7.5	7.3	8.3	6.5	7.	6.4
Ohio	13.9	11.7	12.	15.	9.5	11.8	15.	18.	19.5	18.
Oregon	19.2	18.2	19.	19.5	17.6	17.	20.	21.	16.	17.
Pennsylvania	16.2	10.8	14.2	14.8	13.8	13.2	13.	15.	15.3	15.
South Carolina	5.	6.1	5.5	6.3	7.	8.	9.9	5.5	8.4	4.8
Tennessee	5.	9.6	7.2	9.	8.5	8.3	8.4	5.1	8.	
Texas	11.5	18.5	17.	12.5	18.	13.	12.	16.	7.6	8.5
Vermont	16.6	16.	16.	17.	17.5	14.7	19.	17.	15.2	16.
Virginia	8.	8.4	7.5	7.8	8.	8.5	10.4	7.2	9.2	9.5
West Virginia	10.	10.3	9.6	11.6	6.8	11.	12.2	11.5	13.	14.
Wisconsin	12.2	14.3	16.5	11.5	14.	9.	15.	12.4	12.6	9.8

WHEAT PRODUCTION BY COUNTIES IN OHIO IN 1881.

(Copied from Ohio Agricultural Report).

Counties.	Acres sown.	Bushels produced.	Average per acre.	Acres sown for crop of 1882.	Cost of commercial fertilizers for crop of 1882.
Adams	19,026	141,808	7.4	17,326	$14,615
Allen	36,854	495,381	16.4	31,683	48
Ashland	36,687	572,406	15.6	35,677	8,647
Ashtabula	18,118	295,054	16.2	19,142	38,327
Athens	16,503	132,222	8.	14,193	3,879
Auglaize	40,370	590,880	14.6	38,645	…………
Belmont	26,686	338,167	12.2	26,718	5,794
Brown	24,724	183,302	7.	25,585	4,121
Butler	40,677	519,623	12.7	50,507	677
Carroll	17,750	220,775	14.4	17,762	2,774
Champaign	47,135	849,575	18.	52,313	790
Clarke	43,077	769,593	17.8	45,563	270
Clermont	19,280	130,833	6.7	19,054	5,634
Clinton	34,512	413,211	11.9	38,789	606
Columbiana	22,323	349,054	15.6	23,287	7,132
Coshocton	37,572	396,958	10.5	34,165	189
Crawford	37,200	547,083	14.7	34,024	464
Cuyahoga	11,415	205,867	18.	11,887	26,735
Darke	60,688	1,028,262	16.9	65,456	26
Defiance	28,673	346,938	12.1	26,332	25
Delaware	28,056	404,543	14.4	25,565	363
Erie	26,479	490,056	18.5	20,429	11,662
Fairfield	58,214	706,647	12.1	59,691	3,033
Fayette	41,552	441,502	10.6	42,963	92
Franklin	49,765	734,645	14.7	54,962	7,480
Fulton	29,885	426,615	14.2	27,115	963
Gallia	28,909	179,375	6.2	25,287	8,873
Geauga	7,340	114,829	15.6	7,519	14,680
Greene	50,090	695,400	13.8	54,158	583
Guernsey	20,816	203,730	9.7	18,555	5,689
Hamilton	11,649	119,795	10.2	13,514	1,317
Hancock	56,314	858,079	15.2	53,655	49
Hardin	38,833	578,630	14.9	34,533	21
Harrison	18,023	237,487	13.1	17,013	1,302
Henry	31,361	503,884	16.	28,670	2,693
Highland	39,581	374,238	9.4	40,857	11,285
Hocking	13,057	100,913	7.7	12,895	2,527
Holmes	31,979	424,626	13.2	32,077	4,635
Huron	40,551	636,039	15.6	38,928	2,587
Jackson	10,492	62,022	5.7	9,603	5,357
Jefferson	20,325	320,933	15.7	19,038	2,565
Knox	36,833	424,634	11.5	32,378	118
Lake	7,608	113,039	14.8	7,606	6,148
Lawrence	16,428	74,075	4.5	14,391	420
Licking	45,711	701,630	10.9	47,657	771
Logan	43,838	699,528	15.9	44,612	661
Lorain	27,121	373,524	13.7	22,466	9,146
Lucas	16,532	235,256	14.2	14,416	99
Madison	29,035	480,465	16.5	37,414	…………
Mahoning	14,113	265,432	18.8	21,073	20,144
Marion	34,485	487,404	14.1	32,096	60
Medina	21,989	335,877	15.2	21,538	31,658

Wheat Produced in Ohio in 1881—Continued.

Counties.	Acres sown.	Bushels produced.	Average per acre.	Acres sown for crop of 1882.	Cost of commercial fertilizers for crop of 1882.
Meigs	20,278	153,753	7.5	19,715	$3,125
Mercer	34,191	526,580	15.4	35,982	....
Miami	45,496	843,837	18.5	50,224	415
Monroe	19,824	158,291	7.9	20,075	4,959
Montgomery	43,340	673,815	15.5	49,907	3,578
Morgan	19,835	212,548	10.7	19,979	15,795
Morrow	20,794	251.455	12.1	16,795	181
Muskingum	33,654	352,356	10.4	32,527	12,565
Noble	18,496	161,603	8.7	19,130	3,855
Ottawa	18,302	293,758	16.1	17,878	2
Paulding	13,089	171,432	13.1	13,441	....
Perry	17,416	202,171	11.6	18,942	18,636
Pickaway	60,303	729,572	12.1	63,498	70
Pike	13,417	106,379	7.9	17,353	2,386
Portage	20,256	357,443	17.6	21,037	25,834
Preble	38,483	497,235	12.9	44,025	3,813
Putnam	34,539	569,119	16.4	36,409	55
Richland	40,014	614,197	15.3	39,500	5,063
Ross	53,098	585,729	11.	55,141	533
Sandusky	51,366	851,679	16.5	51,913	99
Scioto	11,526	84,617	7.3	13,000	2,408
Seneca	71,372	1,162,773	16.2	70,601	138
Shelby	38,153	601,522	15.7	36,344	64
Stark	70,275	1,260,048	17.	69,396	33,883
Summit	29,657	588,416	19.8	29,117	13,136
Trumbull	12,824	209,203	16.3	13,646	25,876
Tuscarawas	37,443	482,013	12.8	34,246	1,125
Union	30,792	454,110	14.7	28,389	267
Van Wert	26,048	380,081	14.5	28,917	27
Vinton	10,018	62,147	6.2	8,377	1,592
Warren	29,687	327,621	11.	32,485	863
Washington	34,189	289,880	8.4	29,042	23,754
Wayne	57,586	972,499	16.8	56,428	13,738
Williams	31,703	327,584	10.3	27,151	40
Wood	39,046	663,852	11.8	39,387	321
Wyandot	41,230	592,671	14.3	38,542	....
Totals	2,753,973	38,102,633	13.8	2,745,507	$495,825
Estimate August, 1881	....	38,010,057	....	....	....

Difference between August estimate, 1881, and amount learned through township assessors *one year afterwards*, less than *one-fourth of one per cent.*

Special attention is called to this fact, as showing the accuracy of the results secured by the use of the threshers' blanks, as soon as threshing begins.

Wheat, in 1881, ranked second among Ohio crops in commercial importance. The above crop, at the average price of $1.35 per bushel, would equal $52,438,554.55, or more than four times the value of the annual output of coal in Ohio, valued wholesale at the mine.

In proportion to the labor, too, it is one of the most profitable crops, being worth at the above rates $18.63 per acre, besides the straw and the clover fall feed on the stubble ground.

Stark, Seneca and Darke counties stand highest, in this order, in total yield; and Summit, Mahoning, Miami and Erie stand highest in yield per acre.

EXPERIMENTS WITH INDIAN CORN.

COMPARATIVE TEST OF VARIETIES.

The soil was a heavy clay loam. Planting was delayed on account of cold, wet weather until the 26th of May.

Frequent rains had beaten the ground until it was so hard that it was necessary to loosen the soil with a cultivator, before planting. Heavy rains immediately after planting, followed by hot sunshine caused the ground to bake very hard, and made replanting necessary.

CALENDER OF WORK.

The land was Fall plowed and re-plowed in the Spring, as soon as fit to work.

Cultivated with fine-tooth cultivator, May 25th.

Planted, May 26th.

Replanted, where needed, June 12th.

Cultivated, June 7th, 19th, 22d, July 14th and 19th.

The corn was cut at different times, as it ripened.

Husked, November 7th and 8th.

Weighed, November 9th.

Hoeing was confined to the destruction of weeds.

The corn was planted in drills, 3½ feet apart, and 10 to 12 inches in the row.

Bowker's Hill and Drill Phosphate was applied in the drill before planting, at the rate of 200 pounds per acre.

It will be seen from the table that there was a wide range of time in ripening, consequently the corn was not cured alike.

The weights as given in the table would be materially changed, if the yield of each plot was reduced to dry substance.

The soft corn is due mainly to two causes, replanting and the lateness of some varieties.

The standard of soft corn in this series is much different from the one used in succeeding tables. Here it means corn that did not ripen; there it means all corn which does not come up to the standard of that regarded as fit for milling purposes.

The results might have been more satisfactory in some respects if the corn had not been replanted, but as this is the usual practice among farmers, it was thought best to follow it

It was the intention in these experiments to come just as near to practical farming as possible, and a variety which requires so long a time to mature that it will not bear replanting, is of less value than one that matures in a shorter time. Future experiments may alter these results, but all were treated exactly as set forth in this report, and all things considered, the test is a fair one. It might be supposed that varieties which were largely replanted would show the greatest percentage of soft corn; but this is not the case, except in one instance, viz.: The Anna shows 50 per cent. replant and 35 per cent. of soft corn, but on the other hand, Squirrel-Tooth and Kentucky both show 30 per cent. of soft corn and no replant.

Highest yield, 75.6 bushels.

Lowest yield, 37 bushels

Average yield, 50 bushels.

Greatest percentage of soft corn, 35.

Lowest percentage of soft corn, 2.

Two varieties show none.

Greatest number of days required by any variety to mature, 140.

Least number, 108.

TABLE I.

Variety.	Bushels sound corn per acre, 70 lbs. each.	Bushels soft corn per acre, 70 lbs. each.	Total bushels per acre.	Condition of corn when weighed.	Percentage of soft corn.	Percentage of replant.	Relative percentage of stalks taking heaviest as standard.	Time of ripening.	Number of days from planting to maturity.
Squirrel Tooth	51.7	22.1	73.8	Green	30	....	100	Oct. 9	138
Blount's Prolific	73.3	2.3	75.6	Dry ...	3	....	95	" 2	129
Robinson's White	39.2	.8	40	" ...	2	5	85	Sept. 20	117
Kentucky	40	17	57	Green	30	....	80	Oct. 2	129
Normandy	43.3	2.3	45.6	Dry ...	5	25	80	Sept. 20	117
Fisk's White	51	9	60	Green	15	10	80	Oct. 2	129
Robinson's Speckled	33.6	8.4	42	Dry ...	20	30	78	Sept. 20	117
Anna	33.15	17.85	51	Green	35	50	85	Oct. 13	140
Fisk's Golden	45	5	50	Dry ...	10	20	80	" 2	129
Murdock	52.4	1.6	54	" ...	3	5	80	Sept. 20	117
Sells' Golden	30.4	7.6	38	" ...	20	20	75	" 20	117
Thomas	50.2	2.6	52.8	" ...	5	5	80	" 25	122
Yellow Dent	40	....	40	" ...	....	....	78	" 11	108
Chester Co. Mammoth	33.3	3.7	37	" ...	10	50	80	" 30	127
Leaming	45	....	45	" ...	....	....	80	" 20	117
Variety not named	36.1	1.9	38	" ...	5	....	82	" 20	117

TABLE II.

Variety.	Number of rows on the cob.	Average number of kernels in row.	Average number of kernels on an ear.	Average length of ear.	Middle diameter of ear.	Middle diameter of cob.	Weight of average ear.	Weight of average cob.	Weight of shelled corn on average ear.
				in.	*in.*	*in.*	*lb.*	*lb.*	*lb.*
Squirrel Tooth	18	47	846	7¼	2	1⅛	.53	.07	.46
Blount's Prolific	10	48	480	8	1½	⅞	.39	.05	.34
Robinson's White	17	52	884	8½	2	1¼	.72	.10	.62
Kentucky	14	49	686	8⅓	2⅛	1¼	.53	.12	.41
Normandy	16	48	768	8½	2	1⅛	.68	.11	.57
Fisk's White	12	48	576	8¼	1¾	1⅛	.54	.09	.45
Robinson's Speckled	17	42	714	6½	1¾	1	.38	.05	.33
Anna	13	49	637	7	1¾	1	.49	.05	.44
Fisk's Golden	15	43	645	7½	1⅞	1⅛	.50	.08	.42
Murdock	18	44	792	7	1¾	1	.47	.07	.40
Sells' Golden	15	42	634	7	1¾	1	.44	.08	.36
Thomas	15	49	735	7⅔	1¾	1	.61	.08	.53
Yellow Dent	16	43	688	7⅛	1¾	1	.52	.08	.44
Chester Co. Mammoth	17	50	850	8¼	2	1⅛	.61	.09	.52
Leaming	20	39	780	7⅛	2	1⅛	.55	.09	.46
Variety not named	15	35	525	6⅓	1 3-7	1⅛	.42	.08	.34

TABLE III.

Variety.	Number of ears necessary to make a bushel of ears.	Number of ears to make a bushel shelled corn.	Kernels in cubic inch.	Kernels in bushel.	Weight of cubic inch.	Weight of bushel.	Weight of shelled corn, in 70 lbs. of ears.
					lb.	*lb.*	*lb.*
Squirrel Tooth	132	121.7	46	98,918	.026	55.9	60.7
Blount's Prolific	179.4	164.6	40	86,016	.027	58	59.6
Robinson's White	97.2	90.3	43	92,427	.026	55.9	60.3
Kentucky	132	136.6	36	77,414	.025	53.7	54.1
Normandy	103	98.2	38	81,715	.024	51.6	58.7
Fisk's White	129.6	126.6	30	64,512	.025	53.7	58.3
Robinson's Speckled	184.2	169.6	49	105,370	.025	53.7	60.7
Anna	142.9	127.2	36	77,414	.026	55.9	62.8
Fisk's Golden	140	133.3	42	90,316	.028	60.2	58.8
Murdock	148.9	140	49	105,369	.025	53.7	59.5
Sells' Golden	159	155.5	49	105,369	.026	55.9	56.7
Thomas	114.7	105.6	38	81,715	.026	55.9	60.8
Yellow Dent	134.6	127.2	39	83,865	.027	58	59.2
Chester Co. Mammoth	114.7	107.7	43	92,467	.026	55.9	59.6
Leaming	127.2	121.7	45	96,768	.024	51.6	58.1
Variety not named	164.2	164.7	45	96,768	.025	53.7	55.8

Tables II. and III. give an exhibit of the main points in regard to development of the ears of several varieties.

In determining the average number of rows on an ear of any variety, a number of ears were selected. such as would give the widest range of difference, and their average taken. In all this work not an ear was found that did not have an even number of rows, though the average quite frequently gives an odd number, from the fact that an odd number of ears was used.

The greatest difference in number of rows in any variety was six. Quite a number showed this difference.

The least difference was two; one variety, Sells' Golden, alone, showing this uniformity in number of rows.

The average number of kernels in a row was found in the same manner as the rows, and from these two were found the number of kernels on an average ear. The diameter of the ear and the number of rows bear no relation to each other, as the variety having the greatest number of rows has only a middle diameter of two inches, while the variety having six less number of rows has a diameter of two and one-eighth inches. The size of cob seems to show quite a difference in the weight of shelled corn to a bushel of ears. "Kentucky" shows the greatest weight of cob where it is nearly 25 per cent. of the whole ear, and the bushel of ears only shelled 54.1 pounds of corn. These weights were made after the corn had been thoroughly cured in a dry room. "Anna" shows the lowest percentage of cob where it is but little more than 10 per cent. Here the bushel of ears makes 62.8 pounds of shelled corn.

Robinson's White shows the heaviest average ear, and Robinson's Speckled the lightest.

The greatest number of ears required to make a bushel of shelled corn is 169.6, and the least number 90.3. The greatest number of kernels required to a cubic inch is 49; three varieties showing this number. The least number was 30; but one variety, Fisk's White, falling so low. The number of kernels in a bushel was estimated from number in cubic inch; so also the weight of bushel was estimated from weight of cubic inch. This column bears no relation to column giving weight of shelled corn in 70 lbs. of ears, but is simply estimated weight of measured bushel, while the other bushels spoken of in the table mean bushels by weight.

OBJECT OF THE ABOVE TEST.

It is hoped that the tables given above may throw some light upon the following important questions:

(1). Does the diameter of the ear always *increase with an increasing* number of rows?

(2). What is the relation between the length of ear and number of rows?

(3). Does the *weight* of the ear increase with the number of rows?

(4). Does the weight of cob and shelled corn bear a uniform proportion?

(5). Is the greatest weight of shelled corn from the heaviest cob?

(6). Is the number of whole and shelled ears required for a bushel, greatest with the "*fewer*," "*medium*," or "*many-rowed*," sorts?

The end in view in the solution of these questions is, what length, diameter, number of rows, size and weight of cob, etc., are requisite for the most perfect variety of corn.

PLANTING AT DIFFERENT DEPTHS.

This work came next to test of varieties. Soil of about the same character, prepared in the same manner, and at the same time.

One variety of corn, Leaming, was used throughout this and the two following tests. The corn was dropped with great care and covered accurately, by measurement. Notwithstanding the different depths, it came through at about the same time. There was no marked difference in the growth, except that plots 1 and 2 appeared slightly more thrifty. The following table gives the result of the test:

Plot.	Bushel per acre, 70 pounds each.	Weight of stalks per acre.	Pounds of stalks to 100 pounds of corn.	Manner and depth of planting.	Percentage show'g stand of corn, June 15th.
1	39.	3,950	144.5	Furrow, 1 in.	75
2	53.4	3,906	104.4	" 2 "	100
3	54.6	2,635	68.9	" 3 "	90
4	42.6	2,478	83.1	" 4 "	90
5	53.4	2,962	79.1	On surface, 2 "	100

The corn, when husked, was very uniform in quality, but the table which gives an exact record of the plots, shows a wide difference in some points.

Plot No. 1 shows a stand of 75 per cent., while plot No. 2 shows a stand of 100 per cent., and the latter occupied, if there was any perceptible difference, the poorer place.

By a further comparison of these two plots, we see that while No. 1 shows a decrease of 14½ bushels in yield of corn, it shows an increase of 44 pounds in weight of stalks over No. 2. Plot 1 compared with plot 3, shows 144.5 pounds of stalks to 100 pounds of corn in the former, and 68.9 pounds of stalks to 100 pounds of corn in the latter.

These are curious results. Future experiments may help to explain the discrepancy or give reasons why such a discrepancy should exist.

These plots were planted June 2d, and ripened September 20th, in 110 days. They were cultivated and cared for very much as "test of varieties, care being taken to have each plot treated precisely alike.

THICK AND THIN PLANTING.

The soil of these plots is somewhat lighter than that of the tests just reported, being a coarse, brown loam. The ground for the entire corn work was prepared at the same time and in the same manner. This is perhaps the most interesting and instructive series of tests made with corn. That the tables may be better understood. a plan of the plots is here given. The rows were 3½ feet apart and the distance in the row was guaged by a tapeline.

PLAN OF PLOTS.

No. of plot.	Amount of seed.	Distance apart in drill.
1	One kernel	6 inches.
2	"	9 "
3	"	12 "
4	"	15 "
5	"	18 "
6	"	21 "
7	"	24 "
8	Two kernels	12 "
9	"	18 "
10	"	24 "
11	"	30 "
12	Three kernels	18 "
13	"	24 "
14	"	30 "
15	"	36 "

These plots were planted May 30th.

They were cultivated and treated throughout in the same manner, always exercising care to finish the work in one day, if possible; this was done except in husking and weighing, which was somewhat interrupted, but not in such a manner as to effect the results.

There was a very marked difference in the germination of this corn. The thick planting came through fully two days in advance of that planted at the greatest distances apart.

Upon looking at the plots ten days after the corn came up, one could hardly credit the statement that it was all planted the same date. This same difference was very readily noticed until the corn commenced tasseling. At maturity it stood very even. The stalks of the thickly planted corn were slender and ears much shorter on an average than that planted more thinly.

Table I. gives the essential points in regard to yield of corn and stalks.

It is probable that the results of plots 12 to 15, inclusive, were somewhat affected by the shade of two large black walnut trees, which stood but a short distance outside of the plots.

TABLE I.

Number of plots.	Number of stalks in hill.	Distance between hills, in inches.	Bushels sound corn per acre, 70 pounds each.	Bushel soft corn per acre, 70 pounds each.	Total bushel per acre.	Percentage of soft corn.	Weight of stalks per acre.	Weight of stalks to 100 pounds of corn.
							lbs.	*lbs.*
1	1	6	54.2	9.7	63.9	15.1	5,369	120.
2	1	9	53.1	9.3	62.4	14.8	4,375	100.1
3	1	12	56.4	5.6	62.	9.	3,906	94.3
4	1	15	53.6	6.7	60.3	11.1	3,874	91.
5	1	18	49.1	5.4	54.5	9.9	3,282	86.
6	1	21	46.5	7.8	54.3	14.3	3,419	89.9
7	1	24	37.1	4.7	41.8	11.2	3,185	108.8
8	2	12	58.4	8.3	66.7	12.4	4,996	107.
9	2	18	56.3	7.2	63.5	11.3	5,021	112.9
10	2	24	56.7	6.3	63.	10.	4,368	99.
11	2	30	53.3	4.7	58.	8.1	3,822	94.1
12	3	18	50.3	11.7	62.	18.8	5,499	126.7
13	3	24	46.8	9.	55.8	16.1	4,303	110.1
14	3	30	45.1	10.1	55.2	18.2	4,251	110.
15	3	36	39.1	8.2	47.3	17.3	3,770	113.8

TABLE II.

No. of plot.	Stalks in a hill.	Distance between hills in inches.	Percentage of good ears.	Percentage of nubbins.	Relative number of stalks, 100 representing heaviest planting.	Relative yield of stalks, taking plot 1 as standard.	Relative yield of corn, taking plot 1 as standard.
1	1	6	28.6	71.4	100	100	100
2	1	9	42.5	57.5	66.6	81.5	97.4
3	1	12	61	39	50	72.8	97.1
4	1	15	63	37	40	72.2	94.4
5	1	18	63.5	36.5	33.3	61.2	85.3
6	1	21	78.9	22.1	28.5	63.7	85
7	1	24	74.4	25.6	25	59.4	65.5
8	2	12	41.1	58.9	100	93.1	104
9	2	18	54.8	45.2	66.6	93.6	100
10	2	24	69.4	30.6	50	81.4	98.9
11	2	30	68	32	40	71.2	91
12	3	18	36.3	63.7	100	102.4	97.1
13	3	24	37	63	75	82	87.4
14	3	30	33.8	66.2	60	79.2	86.4
15	3	36	47.2	52.8	50	70.3	74.1

TABLE III.

Number of plot.	Number of stalks in hills.	Distance between hills in inches.	Total bushel corn per acre.	Percentage of soft corn.	Percentage of good ears.	Percentage of nubbins.	Stalks to 100 pounds of corn.	Relative number of stalks 100 per cent. representing heaviest planting.	Relative yield of stalks taking plot 1 as standard.	Relative yield of corn taking plot 1 as standard.
							Pounds.			
1	1	6	53.9	15.1	28.6	71.4	120.	100.	100.	100.
2	1	9	62.4	14.8	42.5	57.5	100.1	66.6	81.5	97.4
3	1	12	62.	9.	61.	39.	94.3	50.	72.8	97.1
4	1	15	60.3	11.1	63.	37.	91.	40.	72.2	94.4
5	1	18	54.5	9.9	63.5	36.5	86.	33.3	61.2	85.3
6	1	21	54.3	14.3	78.9	21.1	89.9	28.5	63.7	85.
7	1	24	41.8	11.1	74.4	25.6	108.8	25.	59.4	65.5
8	2	12	66.7	12.4	41.1	58.9	107.	100.	93.1	104.
9	2	18	63.5	11.3	54.8	45.2	112.9	66.6	93.6	100.
10	2	24	63.	10.	69.4	30.6	99.	50.	81.4	98.9
11	2	30	58.	8.1	68.	32.	94·1	40.	71.2	91.
12	3	18	62.	18.8	36.3	63.7	126.7	100.	102:4	97.1
13	3	24	55.8	16.1	37.	63.	110.1	75.	82.	87.4
14	3	30	55.2	18.2	33.8	66.2	110.	60.	79.2	86.4
15	3	36	47.3	17.3	47.2	52.8	113.8	50.	70.3	74.1

Table II. gives a general exhibit in regard to the development of ears and stalks.

The percentage of ears and nubbins was ascertained by actual count. The standard by which it was graded must necessarily be arbitrary, but it was uniformly applied in all cases.

The percentage of soft corn and nubbins bears no relation whatever to each other.

The more salient points of the two tables are brought out in table III.

The decrease in yield of corn from plot 1 to plot 7 is 34.5 per cent.; the decrease in yield of stalks is 40.6 per cent.; and the decrease in number of stalks is 75 per cent. In other words, we have two-thirds as much corn, three-fifths as much in weight of stalks, and only one-fourth the number of stalks on plot 7 as there are on plot 1.

Plot 8, which has the same number of stalks as plot 1, shows a decrease in weight of stalks of 6.9 per cent. and an increase of four bushels in yield of corn. The weight of stalks to the hundred pounds of corn varies from 86 pounds, the lowest, to 126.7 pounds, the highest.

TEST OF FERTILIZERS ON CORN.

This test did not occupy a continuous piece of ground. Plots 1 to 9 were on the North side of a road which passed through the center of the field, and plots 10 to 18 were on the South side. Though not far apart, the soil varies considerably: that of the North plots being more stiff and clayey, while that of the South plots was lighter and more loamy in character. This necessarily destroys, in a measure, the value of the results. It was thought best, however, to make these simple tests, and for want of better ground, this was used.

There was no time for the preparation of manure, or for selecting from the markets such chemical fertilizers as it might be advisable to test, hence our work was confined to such material as could be readily obtained about the farm.

Further, we had no knowledge of the true condition of our soil, and know but little of its previous management.

The cause of the great difference in yield between the North and South plots is explained, as hinted before, by the difference in soil. That of the latter being much superior to that of the former. These plots were planted June 2d.

The corn, so far as could be noticed, came quite evenly, though the stand was not equally good on all the plots. It was especially poor on plots 1 and 2 and not quite as good on plots 4 and 5, as on others.

The growth for some time was quite uneven.

Plot 9 grew rapidly, and at one time seemed to surpass all others.

The plots treated with salt seemed stunted, and looked pale for some time, but later in the season came fully up with the others..

No attempt was made to replant this series or supply the deficiencies.

The other plots showed no marked differences.

At maturity all seemed to stand about even, and from ordinary observation it would have been impossible to tell which were the fertilized and which the unfertilized plots.

TABLE I.

No. of plot.	North plots.	No. of plot.	South plots.
1	Hen manure, 500 pounds per acre, in hill.	10	Lime, 50 bushels per acre, in hill.
		10½	Lime, 50 bushels per acre, broadcast.
2	Hen manure, 500 pounds per acre, broadcast.	11	Nothing.
3	Nothing.	12	Plaster, 500 lbs. per acre, in hill.
		12½	Plaster, 500 lbs. per acre, broadcast.
4	Pig-pen compost, 15 tons per acre, in hill.	13	Nothing.
5	Pig-pen compost, 15 tons per acre, broad-cast.	14	Salt, 6 bushels per acre, in hill.
		14½	Salt, 6 bushels per acre, broadcast.
6	Nothing.	15	Nothing.
7	Coal-ashes spread so as to thinly cover the ground.	16	Wood-ashes, 50 bushels per acre, in hill.
8	Coal-ashes, plowed under.	17	Wood-ashes, 50 bushels per acre, broadcast.
9	Bowker's hill and drill phosphate, 200 pounds per acre, in hill.	18	Nothing.

Table I. gives the fertilizers used in both North and South plots, and ner of applying them on each.

From this it will be seen that with but two exceptions each fertilizer was used in the hill and broadcast.

These were applied before planting in each case, care being taken to distribute them evenly.

When put in the hill it was carefully mixed with a small quantity of soil, so that the seed should not come in direct contact with the fertilizers.

TABLE II.

Number of plot.	Bushels sound corn, per acre.	Bushels soft corn, per acre.	Total number of bushel, per acre.	Per cent. of soft corn.	Weight of stalks, per acre.	Weight of stalks to 100 lbs. of corn.
1	33.4	6.4	39.8	16.	2,210	79.3
2	35.6	7.	42.6	16.4	3,705	124.5
3	36.	9.	46.3	21.	3,750	115.6
4	36.4	11.5	47.9	24.	3,975	115.3
5	39.4	11.5	50.9	22.5	2,445	68.6
6	33.4	12.	45.4	26.	2,212	67.7
7	31.7	15.4	47.1	33.	2,880	87.3
8	37.3	15.	52.3	29.	2,775	75.8
9	35.1	11.5	46.6	25.	2,700	75.5
10	69.1	8.8	77.9	11.3	4,015	73.7
10½	66.	8.8	74.8	11.7	3,822	96.5
11	69.9	5.1	75.	6.8	3,932	73.3
12	61.2	7.2	68.4	10.6	3,717	89.5
12½	59.9	5.7	65.6	8.6	3,750	83.8
13	66.5	6.6	73.1	9.1	4,125	80.6
14	61.8	9.	70.8	12.7	5,252	118.1
14½	65.6	2.3	67.9	3.5	4,317	90.7
15	70.9	2.3	73.2	3.2	4,070	73.2
16	70.5	2.9	73.4	4.	4,235	82.3
17	67.9	2.5	70.4	3.6	4,317	87.9
18	64.	3.2	67.2	4.9	3,935	83.

Table II. gives the results of the work.

The very low yield of plot 1, compared with plot 11, is in part explained by the fact that 10 per cent. of plot 1 did not come, and in part by the difference in soil. Why plot 1 did not make a good stand would be difficult to explain, for great pains was taken to have the fertilizer thoroughly mixed with the soil. It appeared to have an equal chance with the other plots, yet for some reason, it and other plots mentioned above, failed to make a good stand.

Jun 't will be seen that the fertilizers seemed to have had no beneficial effect on
The rop, as the yield of the unfertilized plots often exceeds those fertilized.
was not these results are unsatisfactory, yet it only indicates the more clearly
and not question demands our careful attention.
The g is no greater problem before the farmers of this State to-day than the
of what kind of fertilizers to use, and how to use them.

GENERAL STATISTICS RELATING TO THE CORN CROP.

1.

Total Production, Acreage, and Value of the Corn Crop of the United States with some Details.

Calendar years.	Total production.	Total area of crop.	Total value of crop.	Average value per bushel.	Average yield per acre.	Average value of yield per acre.
	Bushels.	*Acres.*		*Cents.*	*Bushels.*	
1871	991,898,000	34,091,137	$478,275,900	48.2	29.1	$14 02
1872	1,092,719,000	35,526,836	435,149,290	39.8	30.7	12 24
1873	932,274,000	39,197,148	447,183,020	48.0	23.8	11 41
1874	850,148,500	41,036,918	550,043,080	64.7	20.7	13 40
1875	1,321,069,000	44,841,371	555,445,930	42.0	29.4	12 38
1876	1,283,827,500	49,033,364	475,491,210	37.0	26.1	9 69
1877	1,342,558,000	50,369,113	480,643,400	35.8	26.6	9 54
1878	1,388,218,750	51,585,000	441,153,405	31.8	26.9	8 55
1879	1,547,901,790	53,085,450	580,486,217	37.5	29.2	10 93
1880	1,717,434,543	62,317,842	679,714,499	39.6	27.6	10 91
1881	1,194,916,000	64,262,025	759,482,170	63.6	18.6	11 82
Total	13,662,965,083	525,346,204	5,883,068,121	....	....	....
Annual average	1,242,087,735	47,758,746	534,824,375	43.1	26	11 29

2.

Table showing the Increase in Corn Production in the Western Central States during the Past Thirty Years.

States.	1849.	1859.	1869.	1879.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
Ohio	59,078,695	73,543,190	67,501,144	111,877,124
Indiana	52,964,363	71,588,919	51,094,538	115,482,300
Illinois	57,646,984	115,174,777	129,921,395	325,792,481
Iowa	8,651,799	42,410,686	68,935,065	275,024,247
Missouri	36,214,537	72,892,157	66,034,075	202,485,723
Kansas	....	6,150,727	17,025,525	105,729,325
Nebraska	....	1,482,080	4,736,710	65,450,135
Total	214,561,378	383,242,536	405,248,452	1,201,841,885

3.

TABLE SHOWING THE TEN LARGEST CORN-PRODUCING STATES IN THE CENSUS YEARS OF 1849, 1859, 1869 AND 1879.

No.	States.	1849.	No.	States.	1859.
		Bushels.			*Bushels.*
1	Ohio	59,078,659	1	Illinois	115,174,777
2	Kentucky	58,672,591	2	Ohio	73,543,190
3	Illinois	57,646,984	3	Missouri	72,892,157
4	Indiana	52,964,363	4	Indiana	71,588,919
5	Tennessee	52,276,223	5	Kentucky	64,043,633
6	Missouri	36,214,537	6	Tennessee	52,089,926
7	Virginia	35,254,319	7	Iowa	42,410,686
8	Georgia	30,080,099	8	Virginia	38,319,999
9	Alabama	28,754,048	9	Alabama	33,226,282
10	North Carolina	27,941,051	10	Georgia	30,776,293

No.	States.	1869.	No.	States.	1879.
		Bushels.			*Bushels.*
1	Illinois	129,921,395	1	Illinois	325,792,481
2	Iowa	68,935,065	2	Iowa	275,024,247
3	Ohio	67,501,144	3	Missouri	202,485,723
4	Missouri	66,034,075	4	Indiana	115,482,300
5	Indiana	51,094,538	5	Ohio	111,877,124
6	Kentucky	50,091.006	6	Kansas	105,729,325
7	Tennessee	41,343,614	7	Kentucky	72,852,263
8	Pennsylvania	34,702,006	8	Nebraska	65,450,135
9	Texas	20,554,538	9	Tennessee	62,764,429
10	North Carolina	18,454,215	10	Pennsylvania	45,821,531

4.

TOTAL EXPORT OF CORN AND CORN MEAL FROM 1859 TO 1881, INCLUSIVE, AND THEIR VALUE.

Years ending June 30.	Corn.	Corn meal	Total corn.	Corn.	Corn meal.	T'tal corn
	Bushels.	*Barrels.*	*Bushels.*			
1859	1,719,998	258,885	2,755,538	$1,323,103	$994,269	$2,317,372
1860	3,314,155	233,709	4,248,991	2,399,808	912,075	3,311,883
1861	10,678,244	203,313	11,491,496	6,890,865	692,003	7,582,868
1862	18,904,909	253,570	19,919,189	10,387,383	778,344	11,165,727
1863	16,119,476	257,948	17,151,268	10,592,704	1,013,372	11,606,076
1864	4,096,694	262,357	5,146,122	3,353,280	1,349,765	5,703,045
1865	2,812,726	99,419	3,210,402	3,679,133	1,489,886	5,169,019
1866	13,516,651	237,275	14,465,751	11,070,395	1,129,484	12,199,879
1867	14,889,823	284,281	16,026,947	14,871,092	1,555,585	16,426,677
1868	11,147,490	336,508	12,493,522	13,094,036	2,068,430	15,162,466
1869	7,047,197	309,867	8,286,665	6,820,719	1,656,273	8,476,992
1870	1,392,115	187,093	2,140,487	1,287,575	935,676	2,223,251
1871	9,826,309	211,811	10,673,553	7,458,997	951,830	8,410,827
1872	34,491,650	308,840	35,727,010	23,984,365	1,214,999	25,199,364
1873	38,541,930	403,111	40,154,374	23,794,694	1,474,827	25,269,521
1874	34,434,606	387,807	35,985,834	24,769,951	1,529,399	26,399,350
1875	28,858,420	291,654	30,025,036	24,456,937	1,290,533	25,747,470
1876	49,493,572	354,240	50,910,532	33,265,280	1,305,027	34,570,307
1877	70,860,983	447,907	72,652,611	41,621,245	1,511,152	43,132,397
1878	85,461,098	432,753	87,192,110	48,030,358	1,336,187	49,366,545
1879	86,296,252	397,160	87,884,892	40,655,120	1,052,231	42,707,351
1880	98,169,877	350,613	99,572,329	53,298,247	981,361	54,279,608
1881	91,908,175	434,993	93,648,147	50,702,669	1,270,200	51,972,869

ANNUAL EXPORTS OF CORN.

From 1866 to 1872, 3 per cent. of total crop.

From 1872 to 1882, 6 per cent. of total crop.

CORN PRODUCTION ACCORDING TO POPULATION IN DIFFERENT STATES—CENSUS OF 1880.

Iowa	169.3	bushels per capita.
Nebraska	144.7	" "
Kansas	106.1	" "
Illinois	105.9	" "
Missouri	93.4	" "
Indiana	58.4	" "
Kentucky	42.2	" "
Tennessee	40.7	" "
Ohio	34.9	" "

While Ohio stands among the first five States in actual quantity it ranks ninth in per capita standing.

EXPERIMENTS WITH POTATOES.

SERIES A.—TEST OF VARIETIES.

This series of experiments occupied a piece of low, loamy ground, lying adjacent to a small brook. It was a heavy soil, broken early in the spring, and planted just as soon as it was fit to work. Nine varieties were used; seven of these were planted March 29th—two April 7th. The season was very unfavorable; the ground was cold and wet and the potatoes made a very slow growth at first; the rows could scarcely be traced until May 5th. The plots were all treated alike in regard to cultivation. The table gives only the time of planting, time of ripening and the yield per acre.

It is difficult to say just what day potatoes ripen. The dates in the tables are fixed upon by the appearance and fitness for use of the different varieties.

The plots were planted in drills three and one-half feet apart, and ten or twelve inches apart in the row. The seed was cut after the usual manner, four or five eyes to the piece. Only one piece was planted in a hill. The quality of the potatoes was much better than we had expected. They were of fair size and nearly all marketable.

Plot.	Variety.	Date of planting.	Time of ripening.	Bushels per acre.
1	Early Ohio	March 29	July 26	171
2	Early Rose	" 29	August 15	180
3	Watson's Seedlings	" 29	" 10	172
4	Magnum Bonum	" 29	" 22	145
5	Chicago Market	" 29	" 22	147
6	Mammoth Pearl	" 29	" 22	123
7	Beauty of Hebron	" 29	" 15	149
8	Snow Flake	April 7	" 22	185
9	Belle	" 7	" 30	136

SERIES B.—TESTS OF FERTILIZERS AS A TOP DRESSING.

A few simple comparative tests were made with different fertilizers as a top dressing, upon some of the varieties mentioned in Series A. Plots were accurately measured, and, so far as possible, each fertilizer was applied so that its effect, or non-effect could be readily determined. Some of the materials tried seemed to subserve no good purpose, but were a positive injury. The fertilizers tried were wood-ashes, coal-ashes, lime, gypsum, salt, hen-manure, and a mixture of ashes and plaster, and one of ashes and lime. They were applied May 20th, when the potatoes were about two inches above the ground.

It was a rough test—tried upon a crop that was planted without special reference to experimental work; the main object in view being to learn something of the deficiencies and needs of this part of our grounds. The application was rigorous, and the following indications are among the clearest and most obvious: 1. Good hard-wood ashes are one of the best fertilizers that can be applied to the potato. They gave an increase over the natural yield of the land such as to make their use, at the rate of seventy-five bushels per acre —at twenty-five cents per bushel, profitable. 2. A mixture of ashes and plaster—10 parts by weight of the former to one of the latter—gave about the same results, while plaster alone had no good effect. 3. No advantage whatever was derived from the use of lime, which seems to indicate that there is already a sufficiency of that material in our soil. 4. Salt must be used with caution; anything over five bushels per acre did more harm than good; up to this amount its use will generally be attended with profit. 5. Coal-ashes had a most marked beneficial effect. Spread thickly between the rows and thoroughly incorporated with the soil, their mechanical effect was greater than the chemical effect of any of the fertilizers tried. 6. Hen-manure, made fine and scattered freely, close to the rows, gave excellent results also. It appeared to be of about the same value as wood-ashes. The following result is given:

Early Ohio—wood-ashes	170	bushels per acre.
" —hen-manure	181	" "
Snow Flake—wood-ashes	242	" "
" —hen-manure	235	" "

The object of these brief notes is to induce careful observation, and to incite experiment.

The fertilizers named above can be easily and cheaply obtained in many parts of the State; that they can be generally used with profit I believe. Every farmer should give them a fair, careful trial, and await the result. If they seem to do no good, do not at once condemn, but vary the time and method of application, and try again. If good results do not then follow, it may be reasonably concluded that for your soil and climate they are not the fertilizers needed. Whatever the results of individual experiments may be, it will still be true that in many localities wood-ashes, lime, gypsum, and salt (some one or more of these) are among the best and cheapest fertilizers known.

SERIES C.—DIFFERENT METHODS OF PREPARING SEED AND PLANTING.

This series occupied a narrow strip of uniform soil in the small fruit garden; the soil is a brown loam of rather poor quality. The strip was cut into two rows of plots, lengthwise, fourteen plots in each row. The object of making two rows of plots was to use two varieties side-by-side in the same kind of work. This will be better understood by referring to the accompanying plan. The plots represented by even numbers were Burbank's Seedlings, and the odd numbers Snowflakes, except plots 36 and 37, which were both Burbank's Seedlings, and plots 42 and 43, which were both Snowflakes:

PLAN OF PLOTS.

25	27	29	31	33	35	37	39	41	43	45	47	49	51
24	26	28	30	32	34	36	38	40	42	44	46	48	50

Plot.	Variety.	Time of ripening.	Bushels seed per acre.	Bushels crop per acre.	Method of planting.
24	Burbank's Seedlings	August 30...	8	145	Under straw... } cut ordinary.
25	Snow Flakes...........	" 19...	10	115	Under straw...
26	Burbank's Seedlings	" 30...	7	168	In soil............
27	Snow Flakes...........	" 25...	10	176	In soil............
28	Burbank's Seedlings	" 25...	33	301.5	Large potatoes, whole.
29	Snow Flakes...........	" 11...	32	230	" "
30	Burbank's Seedlings	" 25...	22	310	" cut once.
31	Snow Flakes...........	" 11...	15	214	" "
32	Burbank's Seedlings	" 25...	11	211	Small potatoes, "
33	Snow Flakes...........	" 19...	9	164	" "
34	Burbank's Seedlings	" 25...	14	194	" whole.
35	Snow Flakes..	" 11...	17	152	" "
36	Burbank's Seedlings	" 25...	26	190.5	Large potatoes, seed end.
37	Burbank's Seedlings	" 25...	23	166	" stem end.
38	Burbank's Seedlings	" 30...	7	150	Cut two eyes to the piece.
39	Snow Flakes...........	" 25...	7	128	" " " "
40	Burbank's Seedlings	" 30...	6	164	Cut one eye to the piece.
41	Snow Flakes...........	" 25...	5	118	" " " "

Plot.	Variety.	Time of ripening.	Bushels seed per acre.	Bushels crop per acre.	Method of planting.	
42	Snow Flakes...........	August 19...	11	186	Medium sized potatoes, cut once, length-wise, cut side down.	
43	Snow Flakes...........	" 19...	11	215	Medium sized potatoes, cut once, length-wise, cut side up.	
44	Burbank's Seedlings	" 25...	13	207	9 in. between hills	all cut ordinary.
45	Snow Flakes...........	" 19...	13	210	9 in. "	
46	Burbank's Seedlings	" 25...	9	213	12 in. "	
47	Snow Flakes...........	" 19...	9	207	12 in. "	
48	Burbank's Seedlings	" 28...	6	193	15 in. "	
49	Snow Flakes...........	" 25...	7	135	15 in. "	
50	Burbank's Seedlings	" 28...	5	113	18 in. "	
51	Snow Flakes...........	" 25...	6	87	18 in. "	

The words "cut ordinary" mean four and five eyes to the piece, and the words "planted ordinary" mean one piece in a hill covered four inches deep.

These plots were planted in drills three and one-half feet apart, and in the row as noted in the plan. They were planted the afternoon of May 19th, and the forenoon of May 20th. All were covered the same depth with earth, except plots 24 and 25, which were just slightly covered with earth, and then six inches deep with straw.

The plots covered with earth came through very nearly at the same time—those covered with straw being a few days later.

Large potatoes, whole, grew very rapidly, and in two weeks looked to be ten days earlier than the small cutting.

Large potatoes, cut once, grew nearly as well, and so did small whole potatoes; but those cut with one and two eyes grew very slowly, and, in fact, made only about half the growth in vines. It was impossible to notice any difference in the growth and maturtiy of stem ends and seed ends; so, also, with those planted cut-side up and cut-side down.

Seed ends, though, show the heaviest yield, but were not of as good size. Cut-side up shows considerable better yield than cut-side down; it is difficult to account for this.

Plot No. 30 shows the heaviest yield, 310 bushels per acre, being 8½ bushels in excess of whole potatoes on plot No. 28. The size diminished, somewhat, with the increase in yield, yet all were fair marketable potatoes, and would doubtless have been much better had it not been so very dry during the latter part of July and August.

There could be observed no difference in the size of the potatoes in plot 32, where small potatoes, whole, were used as seed, and in plot 28, where large potatoes, whole, were used.

A very important point is the time of ripening. This was carefully noted, and each plot marked ripe, just when *all* the vines were at the same stage of maturity. The best development of size was obtained on plots 38, 39, 40, 41, 49, 50 and 51.

The results of the plots covered with straw are not reliable as they were injured by pigs.

The large and small potatoes for seed were selected as nearly one size as possible.

The following is a result of a premium experiment made by Jesse L. Delano, of Massachusetts. The test extended over two years. The first year one-fourth of an acre was selected, and divided into two equal parts. The preparation and cultivation of each part was as near alike as possible. Medium-sized potatoes were selected for seed, and these were first cut, so as to divide the seed-end from the stem-end; then each end was cut to two eyes, the stem-ends being planted on one part, and the seed-ends on the other.

They were planted in rows three feet apart, and eighteen inches apart in the row. The result was as follows:

Seed-ends yielded 2,010 pounds, or thirty-three and one-half bushels of merchantable potatoes; stem-ends yielded 1,890 pounds, or thirty-one and one-half bushels of merchantable potatoes, a difference of sixteen bushels to the acre in favor of seed-ends. The quantity of small potatoes on each part did not vary materially. The seed-ends germinated, blossomed and matured the earliest.

The second year one acre was divided into eight plots of twenty rods each, and medium-sized potatoes used for seed, cut to one eye, two eyes, four eyes, and one-half potatoes, keeping the seed ends and stem-ends separate, as before. The following table gives the results:

Number of plot.	Kind of seed.	Weight of seed in pounds.	Weight of crop in pounds.	Crop in bushels.	Weight of large potatoes.	Bushels of large potatoes.	Weight of small potatoes.	Bushels of small potatoes.
	Stem-end.							
1	One eye	18	960	16	912	15¼	48	¾
2	Two eyes	30	1,500	25	1,408	23½	92	1½
3	Four eyes	46	1,815	30¼	1,652	27½	163	2¾
4	Half of potato	60	1,440	24	1,234	20½	206	3½
	Seed-end.							
5	One eye	19	1,050	17½	1,015	17	36	½
6	Two eyes	24	1,560	26	1,470	24½	90	1½
7	Four eyes	47	1,905	31¾	1,745	29	160	2¾
8	Half of potato	61	1,560	26	1,320	22	240	4

He planted his seed in rows three feet apart. In plots Nos. 1, 2, 5 and 6 the hills were fourteen inches apart, and those of plots No. 3, 4, 7 and 8 were eighteen inches apart.

From the above experiments the following conclusions were deduced: The stem-end and the seed-end are both alike good for seed, the difference, if any, being in favor of the seed-end; neither one eye nor two eyes is sufficient seed (unless the hills be made too thick for easy cultivation); nor is half of a large potato as good as a piece containing only four eyes.

The following is the first of two parallel series of potato trials instituted by the New York Agricultural Experiment Station and Houghton Farm (Experiment Station). The rows were placed three feet apart, and the hills one foot apart in the rows. The seed was planted at different depths for both level and ridge culture. The figures are taken from twenty average hills, in rows of like treatment, manured and unmanured. The yield per acre is estimated by regarding twenty hills, as planted, as 1-726th part of an acre.

How cut and planted.	Potatoes in 20 hills.	Weight of product—20 hills.		Estimated yield per acre.
At Houghton Farm—manured plots.	*Number.*	*Lbs.*	*Oz.*	*Bushels.*
Single eyes, cut shallow	89	2	6	20¾
Single eyes, cut deep	101	6	11½	81¼
Ordinary cutting and planting	175	18	8	224
Whole tubers, ordinary planting	224	19	3	239¾
Potato peelings, pared close	268	11	8	139
At Houghton Farm—unmanured.				
Single eyes, cut shallow	134	2	6	20¾
Single eyes, cut deep	109	5	15	72
Ordinary cutting and planting	192	16	13	203½
Whole tubers, ordinary planting	208	14	8	175½
Potato peelings, pared close	228	9	15	120¼
At New York State Agricultural Experiment Station.				
Single eyes, cut shallow	52	3	13	37¼
Single eyes, cut deep	129	15	13½	191
Ordinary cutting and planting	177	16	13¼	202
Whole tubers, ordinary planting	177	13	1½	158
Potato peelings, pared close	Not yet	reported.		

TABLE SHOWING THE PRODUCT, AREA, AND VALUE OF THE POTATO CROP OF EACH STATE FOR 1881.

States.	Potatoes.		
	Bushels.	Acres.	Value.
Maine	3,342,248	64,274	$2,573,531
New Hampshire	1,831,158	29,066	1,464,926
Vermont	2,691,620	38,466	2,018,715
Massachusetts	1,814,230	32,986	1,814,230
Rhode Island	362,880	6,048	362,880
Connecticut	2,083,315	32,051	2,124,981
New York	20,143,914	353,402	17,525,205
New Jersey	2,400,960	40,016	2,496,998
Pennsylvania	8,811,600	183,575	8 547,252
Delaware	172,903	4,021	172,903
Maryland	959,905	20,415	988,702
Virginia	1,348,280	33,707	1,159,520
North Carolina	709,916	18,682	496,941
South Carolina	98,460	3,282	69,907
Georgia	294,245	8,407	176,547
Florida	59,040	1,476	32,472
Alabama	366,864	7,643	330,178
Mississippi	298,320	7,458	274,454
Louisiana	203,034	5,343	192,882
Texas	277,440	6,936	271,891
Arkansas	440,484	10,011	436,079
Tennessee	1,394,447	32,429	1,115,558
West Virginia	1,062,720	23,616	1,052,093
Kentucky	1,602,803	43,319	1,602,803
Ohio	4,674,459	150,789	5,141,905
Michigan	7,632,162	131,589	6,105,730
Indiana	2,961,910	84,626	3,139,625
Illinois	6,322,464	131,718	6,638,587
Wisconsin	7,221,600	96,288	6,066,144
Minnesota	5,031,390	52,962	3,270,403
Iowa	6,541,150	118,930	6,671,973
Missouri	2,662,881	68,279	2,982,427
Kansas	2,627,586	69,147	3,415,862
Nebraska	1,496,736	31,182	1,466,801
California	4,479,245	52,697	3,583,396
Oregon	1,238,895	10,773	619,448
Nevada	294,300	3,270	397,305
Colorado	428,560	5,357	557,128
Territories	2,761,370	27,434	1,932,959
Totals	109,145,494	2,041,670	99,291,341

The crop of 1881 was called an almost total failure in Ohio. The State stood No. 8 in the number of bushels produced, while it ranked third in the total number of acres planted. Notwithstanding, the low average the crop returned an income of about $56.00 per acre.

TABLE SHOWIG THE ANNUAL PRODUCT, ACREAGE, AND VALUE OF THE POTATO CROP OF THE UNITED STATES, FROM 1871 TO 1881, INCLUSIVE.

Year.	Quantity.	Area.	Value.	Value per bushel.	Yield per acre.	Value per acre.
	Bushels.	*Acres.*		*Cents.*	*Bushels*	
1871	120,461,100	1,229,912	$71,836,671	59.6	98.6	$58 83
1872	113,516,000	1,331,331	68,081,120	59.9	85.2	51 14
1873	106,089,000	1,295,139	74,774,890	70.5	81.9	57 74
1874	105,981,000	1,310,041	71,823,330	67.7	80.9	54 83
1875	166,877,000	1,510,041	65,019,420	38.9	110.5	43 06
1876	124,827,000	1,741,983	83,861,380	67.2	71.6	48 14
1877	170,092,000	1,792,287	76,249.500	44.8	94.9	42 54
1878	124,126,650	1,776,000	73,059,125	58.9	69.9	41 14
1879	181,626,400	1,836,800	79.153,073	43.6	98.9	43 09
1880	167,659,570	1,842,510	81.062,214	48.3	91.0	44 00
1881	109,145,494	2,041,670	99,291,341	90.9	53.5	48 68
Total	1,490,401,214	17,698,714	844,202,474	....	....	....
Annual average	135,491,019	1,608,974	76,745,679	56.1	84.2	47 08

From the above table it will be seen that the average yield of potatoes per acre, for the whole country is much lower for the year 1881 than for the ten years preceding. It is less than one-half the average for 1875. In spite of this remarkably low *average* yield, the value per acre for the year is above the average for the eleven years, showing that a partial failure of a crop does not always reduce the income received from it.

EXPERIMENTS WITH FRUITS AND VEGETABLES.

LARGE FRUITS.

But little has been done by the Station in the way of experimenting with the large fruits. Not because we desired to do nothing in this direction, but because we had meagre means with which to work.

A small orchard or fruit garden was established upon the University Farm in the spring of 1879. The land was first thoroughly drained, then liberally fertilized, and double-plowed to the depth of twelve inches. It was then planted with apples, standard and dwarf pears, cherries, and a few plums, quinces and grapes. The space between the apples and cherries is devoted to small fruits. The garden is protected on the north and west sides by a double row of Norway Spruce. In a brief report of the condition of the Horticultural Department of the State University, made last fall to the Board of Trustees, the Director uses the following language:

The extreme severity of the winter of 1880–81, followed as it was by an equally severe and long-protracted summer drouth, left the fruit garden in a bad condition. Over sixty per cent. of the apple-trees were killed outright, while some of the pears and many of the small fruit-plants suffered a similar fate. Most of these losses were made good by replanting last spring, and the list of varieties was considerably increased.

I sent to New York for the greater part of the apple-trees, thinking that a selection from a stock raised in a higher latitude might prove more hardy. At all events, it will be interesting to compare the growth, fruitfulness, etc., of the same varieties of apple-trees grown in Western New York and at Columbus, Ohio. The short experience that I have had in practical fruit culture here in Central Ohio is not reassuring. It shows that our capricious climate is more unfavorable, even to hardy fruits, than that of corresponding or higher latitudes in other States. I do not wish to discourage the cultivation of fine fruit, and would like to see every country home have a small but well-selected orchard and fruit garden for its own use. Yet, excepting a few favored localities, our best fruits cannot be raised throughout Central Ohio with anything like the success and profit that follows the cultivation of wheat or corn. Fine fruit *can* be grown here at the University, but not with profit or satisfaction, for the soil is not congenial, and the climate is unfavorable.

Of the large fruits, we have in our garden over twenty varieties of the apple, sixteen of pear, nine of cherries, and a small collection of plums, peaches and quinces. The vineyard is small and bore but little fruit the past season. We are preparing for its extension next spring.

The Station has begun a series of experiments with some of the large fruits mentioned above—the object being to find out, if possible, the most suitable varieties and best methods of culture for Central Ohio. The trees selected for the tests stand upon ground nearly even in quality, and are of the same size and habit of growth.

One experiment that will be continued for several years, is to test the comparative effects of mulching cultivation, and cropping with grain, grass, and vegetables around the trees. Last spring we mulched some trees with coarse farm-yard manure, and some with tan-bark; the ground around others was kept cultivated while oats were sown about some, and still others stand in grass. Notes have been taken of the average growth and thriftiness of the trees, but it will take several years before any results of value can be secured. The health or hardiness of fruit trees cannot be measured by a tape-line. Growth is by no means a certain indication of vigor. For this reason mere measurements of one summer's growth would be useless, and, perhaps, misleading. Another series of experiments in different methods and time of pruning has also been instituted. To be of any service this also must extend over a long period of years.

There can be little doubt that the usual method of treating fruit trees here in Central Ohio is susceptible of great improvement. It is hoped that some well directed and carefully executed experiments, will furnish some facts that will prove of great value to the large fruit culturist. Through the kindness of Prof. S. M. Tracy, of the Missouri State University, the Station has received two or three roots each of eighty varieties of grapes. These will be tested, and their merits or demerits reported.

TESTS WITH SMALL FRUITS.

The Station has made a fair beginning in the way of experimenting with small fruits. But at the present time can only report progress. It is the purpose to test every variety of the small fruits that merits attention. Different methods of cultivation and different systems of pruning have already been inaugurated.

The strawberry, which presents in its various varieties, different forms of inflorescence, has been made a special subject of study, and tests, whose object is to show the best time and method of pruning and training the raspberry, gooseberry, and currant are also in progress. Experiments with the insect enemies of small fruit will be reported in another place.

GARDEN VEGETABLES.

The following is a list of the various crops raised, and the amount of land devoted to each: dwarf, or bush beans, one sixteenth acre; early beets, one-eighth acre; cabbage and cauliflower, one acre; carrots, one-quarter acre; celery one-eighth acre; cucumbers, one-eighth acre; egg-plant, one-sixteenth acre; onion, three-quarters acre; parsnip, three-quarters acre; peas (early and late), one-half acre; salsify, one-sixteenth acre; squash, one-sixteenth acre; tomato, three-quarters acre; turnip, one-half acre.

The early peas were followed by cucumbers for pickling, early potatoes by turnips, and the celery was also grown as a second crop, making upon a considerable portion of the ground devoted to vegetables, two crops in the season.

In the cultivation and management of these crops the most economical and effective means of culture known was adopted. A careful account of the expense of seed, fertilizer, and labor of each crop is kept. By this means the cost of production is readily estimated.

The past year has not been altogether favorable for vegetable gardening. Alhough the spring was exceptionally early, the warm weather of early March was followed by severe and long-protracted rains, cold wind, and more or less frost, which proved very trying to all early garden crops.

It is never a pleasant duty to review failures, yet they will occasionally occur in vegetable gardening as well as elsewhere, though the best may have been done to achieve success. The most marked failures were with squashes and celery. The cause of failure with the former was cold weather and insect enemies; with the latter, poorly grown plants and hot, dry weather.

The following is the total cost of raising some of the crops mentioned: Carrots, twenty cents per bushel; onions, forty-two cents; turnips, twelve cents; peas, forty-eight cents.

SWEET CORN.

Ten choice varieties were planted and careful notes made on their growth and time of maturity. They were planted June 3d, in a fine, loamy soil.

Italian Late Mammoth.—Large stalked variety, grows six and seven feet high; ears large, well filled, sometimes two on a stalk; matured for table use September 6th.

Marblehead.—Very small, two to four feet high, ears short, generally plump, very early, ready for use August 4th.

Early Eight Rowed.—Medium stalk, well developed ear, ready for use September 1st.

Egyptian.— Quite large stalk, makes a strong, rank growth, long, well formed and well filled ears, of a fine quality, ready for table September 6th.

Black Mexican.—Stalks rather weak, ears slender, but well filled, is doubtless a very fine table corn, ready for use September 1st. The sweetest variety grown.

Adams' Early.—Good, strong stalk, short, solid ears, ready for use August 20th.

Crosby's Early.—Stalk slightly weaker than Adams', fine, well developed ear, quite early, August 15th.

Tuscarora, or Rice.—Slender stalk, medium height, long, slender ears, well filled, ready for use September 6th.

Livingston's Evergreen.—Middling heavy stalk, ears large, well filled, September 1st.

Stowell's Evergreen.—Large, heavy stalk, ear coarse, not as well filled as other late corn, about September 1st.

BEANS.

The following fourteen varieties were planted June 5th on small plots, and a few notes made in regard to their growth and maturity:

Ivory Pod Wax.—Small grower, not very prolific, fine, white pods, ready for use (green) July 31st.

Golden Wax.—Small grower, not very prolific, white pods, July 24th.

Black Wax.—So far as could be noticed, the only difference of importance in the varieties of the Wax Bean was that of color. All grew nearly alike, ready for use July 24th.

White Wax.—Ready for use July 31st.

Beans with white or golden pods are preferred in the market to those with coarse, green pods, such as many of our common string beans have.

Dutch Case-Knife.—Large, bushy vines, slightly climbing, but it is not necessary to use poles, very prolific bearers, late, about middle of September.

Early Yellow, Six Weeks.—Medium large, prolific, dark pods, July 24th.

Refugee.—Large bush beans, very rank and prolific, dark pods, ready for use August 22d.

Navy.—These are also a late bean, medium growers, bushy top, fruit small and fine, ripen about middle of September.

Large White Lima.—Very large growing pole bean, late, fruit very large, did not ripen.

Dwarf Horticultural.—Large bush bean, prolific bearer, dark pods, ready for market August 15th.

Dwarf Kidney.—Large growing bush bean, prolific, dark pods, ready for market July 25th.

Early Mohawk.—Large bush beans, very prolific bearers, dark pods, ready for market July 24th.

Early Valentine.—Large bush bean, dark pods, ready for market July 31st.

Red Giant Wax.—Is not a thrifty grower, late and poor, dark pods, ripened about middle of September.

Beets.—Eight varieties tested; earliest, Egyptian Blood Turnip; best for market, Dewing's Improved Blood Turnip; best winter, Long, Smooth Red.

Cabbage.—Nine varieties tested; earliest, Jersey Wakefield and Henderson's Extra Early; most profitable market variety, Early Winningstadt; best late, Livingston's Premium Flat Dutch; largest, Marblehead Mammoth.

Cauliflower.—Earliest, Extra Early Dwarf Erfurt and Early Snow-ball; the latter headed better than the former; largest head and most reliable, Early Paris.

Carrots.—Four varieties tested; earliest, Early Scarlet Horn; most productive, Long Orange and Denver's; the former being preferred in market.

Celery.—Four varieties; the two best, Henderson's Half Dwarf and Boston Market.

Cucumbers.—Five varieties; best early, Early white Spine; finest for pickling, Improved Long Green.

Egg Plant.—Three varieties; earliest, Long Purple; largest and most productive, New York Purple.

Lettuce.—Five varieties; earliest, Early Curled Simpson; largest and best for summer, Hanson; best for growing under glass, Early Tennis Ball.

Onions.—Eight varieties; most productive, Large Red Wethersfield; best for market, Yellow Danvers; finest for home use, and esteemed for pickling, White Portugal or Silver Skin.

Parsnip.—Two varieties; best, Hollow Crown.

Parsley.—Four varieties; most desirable, Carter's Fern-Leaved and Myatt's Garnishing.

Peas.—Eleven varieties; earliest, Philadelphia Extra Early; most productive and of first-rate quality, Bliss' American Wonder; this variety is half dwarf and wrinkled; very early; best for general crop, Champion of England.

Pepper.—Five varieties; earliest and largest, Bull Nose; most marketable, Long Red.

Radish.—Six varieties; best early, French Breakfast; finest quality but later, Scarlet Turnip; good for winter, Black Spanish.

Squash.—(Summer), three varieties; (winter), six varieties; all failed.

Tomatoes.—Six varieties; earliest, Hundred Day; next earliest, Conqueror; most profitable market variety, Acme; smoothest and most handsome, Livingston's Perfection. Mr. F. H. Hosford, of Vermont, sent us some seeds of a cross between Lester's Perfected and the Acme. The plants grew vigorously, and yielded largely. Not so smooth and beautiful as the Acme, but well worthy of further trial. Its flesh is solid, skin firm, and seeds few.

Turnip.—Seven varieties; earliest, Early Purple Top Munich; best for market, Early Purple Top Strap-Leaved; best Swede turnip, Improved American Yellow Rutabaga.

Many other vegetables of less importance were grown.

VEGETABLES FROM JAPAN.

Through the kindness of Prof. T. C. Mendenhall, the Station received about thirty varieties of vegetable seed from Japan. Only a small per cent. of these appeared to be adapted to our soil and climate, and with few exceptions, none of the varieties were equal to those that we now cultivate.

Two varieties of radish grew very rapidly, were white, large and tender. The quality was not equal to that of the French Breakfast. The beets and carrots were poor. Some of the squashes were of good quality, but rather small. One variety of lettuce was very good, and appeared to do well in hot, dry weather. There were several varieties of beans, some of which were very productive and bore very long pods. The beans themselves were small and variously colored.

CHANGE AND IMPROVEMENT IN VARIETIES THROUGH THE SELECTION OF SEED.

It is the general belief of market gardeners and others, that seeds saved from the fruit that matures first, induces early maturity. With many of our garden vegetables this is one of the most desirable objects of attainment. From some observations made during the past, we have become much interested in this question, and have begun a series of tests which we hope to extend through several years. The object being to find out, if possible, which has the greater influence over the seed—the *plant* or the *individual fruit* from which the seed comes. To illustrate: Do we gain anything in earliness by saving seed of the first ripe tomatoes, egg plant, etc., over saving that from later maturing fruit from the same plant. The later ripening fruit, as a rule, being more perfectly developed and having better seeds than the earliest specimens, which are more or less abnormal. To test this question, we have saved seeds from the earliest and also from the later maturing fruits of the same plant, which will be carefully compared the coming year.

LARGE SEED.

Another question of vital importance is the effect of using *large seed*, without reference to the individual plants, from which they came. For example; nearly all the seed wheat, oats, and barley is selected by the berry alone.

It is also a well known fact that in many localities our farmers are yearly increasing the amount of seed per acre; many tests seeming to show that a better crop can, as a rule, be secured by thick than by thin seedling. This sustains them in the practice Yet the fact remains that one of the largest crops of wheat ever grown, was raised from a seeding by hand of one peck per acre. This shows the possibilities of the seed, and if the conditions are favorable so that each kernel can do its best, this ought to answer.

It is very evident that any process of selection by the berry or kernel alone, increases the proportion of seed from plants, which, from injury or other cause, produce only a few seeds and these in very imperfect heads. In the eighty varieties of wheat examined at the Station the past year, it was found that in almost every variety, large, often the largest kernels, came from the shortest and poorest heads, just as the finest individual kernels of corn are often found on the very smallest and most imperfect ears.

If a large proportion of our seed is procured simply by selecting the largest kernels or berries, without reference to the plant, are we not cons antly breeding from many of the poorest plants, and so really decreasing the "fold" produced. If our seed grains were selected from the best plants, those that bear the greatest number of finest heads, rather than from the largest kernels, we would hear less about the "*running out*" of varieties, decrease the amount of seed necessary to use, and largely increase the yield per acre. Many facts could be cited in support of this proposition.

The history of all new varieties points that way. During the time the seed is scarce it is usually sown thin and the variety does well. When it becomes more abundant it is sown with a more lavish hand and it begins to fall off, not always or at once in *quality* but in *quantity*.

Another question that the Station hopes to throw some light upon is this: Does the relative time from the germination of the seed to the perfection of the fruit affect the earliness of the seed. That is, if from the same sample we sow some seed at the earliest possible date, so that it is a long time before it develops fruit, and then sow some later, after the season becomes advanced, so that it perfects fruit in a much less time, and continue this through a series of years, shall we thereby decrease the time necessary to perfect the fruit, or increase the earliness. All this bears upon the question of Northern grown seeds. Tests made the last year with peas and sweet corn clearly indicate that, other things being equal, crops raised from seeds grown where the seasons are short, mature earlier than those grown where the season is longer. More careful tests are needed upon this point. Probably many of the crops grown in more northern latitudes are earlier because sowed later they advance more rapidly.

INFLUENCE OF CLIMATE AND LATITUDE UPON SEEDS.

That fruit of the best keeping quality, and seeds of the greatest weight and vigor are found near the Northern limit, at which the crops producing them are cultivated, is a fact beyond dispute. Yet how far and over what distances seed may be changed with profit, is an unsettled question. Our own experience, together with the tests made at the Station the past year, go to show that any radical changes of seed, such, for example, as from New England or Minnesota to Central or Southern Ohio, is not usually accompanied with profit. In fact, failure is often the result. Corn, wheat, and other grains and seeds which fully perfect themselves here, have when sown, almost invariably given better results than the same variety of seed obtained from localities distant, where the conditions of soil and climate are different. While a change of seed is often desirable, it is, as a rule, best not to go far from the latitude where the crop is to be grown. The most improved varieties and the best methods of culture with staple crops in any given locality, are unquestionably the best for that locality, or at all events, such varieties and such methods are the most susceptible of improvement.

While new and better varieties may and should be tried, yet, if the change is a violent one, it should be done upon a small scale. If the seed adapts itself to the new situation and produces well, there will be an abundance for future use. If it fails, the experiment will have been costly enough, though not so dear as if more had been attempted.

The following abstracts from a letter written by Mr. N. P. Graham, of Manton, Wexford county, Michigan, are quoted, as samples of many inquiries upon the same subject:

"I read a great deal of the effect of climate upon the growth of plants, and the changes that take place in the characteristics of certain plants when grown in a northern climate; of the vigor which the seeds of northern grown plants possess when transferred to warmer climates, and many other points which you are doubtless more familiar with than I am. What I wish to know is, if there are any tests or experiments which you think would be of benefit, and which you would like to make if the way were open to do so?

For example: In Chippewa county, Lake Superior district, our climate is very cold, the summer seasons short, and the soil a peculiar red clay, mixed with lime. The oat crop grows there with almost tropical luxuriance, sixty-five and seventy bushels to the acre; the oats are much heavier than common, weighing thirty to forty pounds a bushel. Oats have been grown there five years. Would oats grown there and used as seed in Ohio produce larger crops than home-grown seed? and would the vigor of growth be permanent, or would the seed speedily degenerate to a level with that of common oats? I imagine (?) that the so-called "Norway" and "White Russian" oats are oats grown simply in cold climates; that they are not special varieties at all. Is the subject one worth investigating? or any other that may suggest itself in this connection?

I am trying to do something in the line of getting early varieties, but have, of course, no results as yet. Corn is grown here, (Manton); would this northern-grown corn be valuable to test at the south in respect to earliness or for breeding? We have that which has been grown here eleven years.

I am not so large a farmer yet that I could furnish any considerable quantity of seed free of expense, but any small amount I think I could get for you."

IMPROVEMENT OR MODIFICATION OF VARIETIES BY CROSSING AND HYBRIDIZING.

The Station has made a fair beginning in this work. Various garden vegetables have been crossed and the seeds saved for future experiments. Some interesting tests have been made with corn, the object being to find what effect is produced by the cross-fertilization of different well-matured varieties the first year.

Plots were laid out in different parts of the experimental grounds, just as far distant from each other, and from all other corn as possible. Each plot consisted of three rows of about one rod in length, the rows being three feet apart, and the corn about 18 inches apart in the row.

These plots were planted as represented in the following diagrams:

PLOT 1.	PLOT 2.
Flint Corn.	Dent Corn.
Dent Corn.	Flint Corn.
Flint Corn.	Dent Corn.

PLOT 3.	PLOT 4.
Dent Corn.	Sweet Corn.
Sweet Corn.	Dent Corn.
Dent Corn.	Sweet Corn.

PLOT 5.	PLOT 6.
Flint Corn.	Sweet Corn.
Sweet Corn.	Flint Corn.
Flint Corn.	Sweet Corn.

PLOT 7.	PLOT 8.
Red Corn.	White Corn.
White Corn.	Red Corn.
Red Corn.	White Corn.

In all the above tests great pains were taken to use pure seed of well established varieties. Owing to long-protracted rains, and an unfavorable season in general, the corn was not planted as early as we desired, and the growth was less vigorous than it would ordinarily have been.

Each plot was carefully watched, and before the centre row showed the first signs of flowering or tasselling, the whole top joint of each stalk was removed. By so doing, fertilization of the centre rows in each plot could only take place by the pollen from the two adjacent outside rows.

The results of the tests were equally interesting and unexpected. Ears were generally formed upon each stalk of the former rows, though they were uniformly smaller and less perfect than the ears of the same variety from the outside rows.

In scarcely a single instance was the effect of the cross shown, and in no instance was the change more marked than that seen when the variety was planted by itself. The Flint corn was to all appearance pure Flint, and the Dent, pure Dent. The Sweet corn was also unchanged. Even the red and white varieties preserved their respective colors with very slight modification. It appeared almost certain from the results of these tests that the changes seen, excepting, perhaps, size and quality of ear, were the results of cross-fertilization of previous years. These investigations will be continued next season.

A NEW HYBRID CORN.

Through the kindness of Prof. W. W. Tracy, Superintendent of the extensive experiment and testing grounds of D. M. Ferry & Co., of Detroit, the Station received four kernels of corn, which were supposed to be a cross between the Cuzco and some variety of sweet corn. This proved to be the case. Four ears of fair size were developed, which plainly showed the mixture of sweet or wrinkled, and the larger, smoother, white kernels. The specimens are quite interesting, and, if it grows well another season, may form the basis of some new and valuable varieties. The "Cuzco" is a variety of corn grown by the Cuzco Indians, in the Andes mountains, and forms a large part of their subsistence. The kernels are as large as small Lima beans, and have a very thin bran. The ripened corn is prepared for use by simply boiling the kernels whole.

HOW TO IMPROVE OUR SEED CORN.

There can be no doubt that seed-corn can be greatly improved by careful breeding. That is, plant carefully selected corn in a plot by itself, fertilize the soil liberally, and give extra cultivation. Watch the corn carefully, and remove or cut off the tops of all the poor stalks before they begin to flower or show signs of tasselling.

This has been practiced by Prof. W. J. Beal, of the Michigan Agricultural College, and by Dr. E. L. Sturdevant, Director of the New York Experiment

Station, with excellent results. The Station has now on hand a quanity of seed-corn, which it hopes to improve in the same way.

At least one intelligent and enterprising farmer in Ohio, Mr. L. N. Bonham, of Oxford, thinks the experiment sensible, and likely to produce valuable results. The following letter, addressed to the Station last October, will be read with interest:

Prof. W. R. Lazenby, Columbus, Ohio:

DEAR SIR: You have doubtless heard of the corn exhibit at Cincinnati Exposition. I had the pleasure of examining it closely. There were about sixty competitors from the States of Ohio, Kentucky, Indiana, Illinois, and Tennessee. The premium went to Kentucky; that was for white corn. The best yellow came from Clermont county, Ohio. I proposed to Duhme & Co., who gave the premium, that they send an ear from each lot of corn to you for the Museum. The plan was accepted on condition that I should select the specimens and label them. I spent Friday in the city, and went carefully over the whole lot, and selected a good specimen ear from each exhibit, and, as far as the cards of entry could be found, I placed on the tag on the ears sent you, the name and residence of the raiser of the corn. I am sorry that I could not have had the privilege of making the selection before the corn was moved from the Exposition building; I found it dumped into barrels and boxes in the rear part of a dark grocery store, and there I examined it all, and labeled it as best I could. Now, if these samples will be of any value to you, I will be glad; if with each ear I could have given the place where it was grown, and the name of the raiser, and the variety, I would have been better pleased.

The majority of the white corn was either Hunt's Improved White, or King's White, or a hybrid from these hybrids. I propose to make another hybrid by mixing the choice ears I got there for my own planting. I got a few of the choicest specimens of white and yellow; I will thus have two hybrids—a white and a yellow. I shall give the plantings a good chance, and when the corn shoots I will go through and castrate every scalawag stalk, just as I do my pigs, bucks, and bulls. I will keep this up a few years and hope to increase the productiveness of my corn. That is one of the experiments I suppose you will make, some time there, if you have not already.

I was interested in noticing that the white corn was far better than the yellow—that is, the specimen ears were more uniform in color, size and shape of grain, and cob. The yellow was very uneven in form and color, and showed that it was usually mixed; very little of it showed evidence of being pure or moderately well bred. Again—I noticed that as the corn was grown further north, it was smaller and harder in grain.

The selection of seven ears showed, too, that the average farmers' ideal ear is simply "a big thing." Many of the ears sent in were deformed; many had shallow grains and monstrous cobs—cobs all out of proportion with the size of grains; they were very unprofitable ears.

If the corn sent you yesterday by the U. S. Express Co. is deemed worthy of a place in your Museum, I would suggest that you name as donor Duhme & Co., Cincinnati, O.

I have a lot of last year's corn, grown in Michigan and Indiana, that I will send you if you would like it.

I owe you an apology for not noticing your card of July 17. When it came I was impressed with the importance of it, and thought I would give the matter some thought and reply; but just then I was pressed with work incident to the late flood and increased farm work. As that was followed by a few weeks illness, and that by a call from home—all of which made it more difficult for me to find time for other than absolutely necessary work—the result has been I have seemed to you to lack interest in your polite request. I suppose, now, suggestions will be too late, as your scheme is prepared and your line of experiments begun.

I will suggest that to us of the valleys and southern part of the State the corn question is not yet solved. How to increase the corn crop, or how to secure uniformly larger crops than we get is a possibility that I think worth reaching for. Nor do I believe it is to be reached so much by the use of improved implements and fertilizers—for these are now abundant and excellent—but, I think we need to improve the seed. We can do more to make our stock profitable by careful selection of breeders, than we can by improved kinds of feed and shelter. So I think the average farmer knows very little about improvement of seed, of corn, or cereals. If they did we should not hear so much about corn, wheat, and potatoes "running out." The breed of racers or trotters is not "running out"; nor is any established breed of animals. But not so with corn; we need to know much more about the application of the law of selection, and how to cause only the fittest to survive, before we can hope to develop a better breed, or more prolific breed of corn. We need a corn that has better fattening qualities; a corn that will lay on more pounds to the acre of ground fed over by the crop, or the roots of the crop; a corn that will pay more for its keep—as we say of Short-horns and Poland Chinas. Can we get it by selection, if we only know how to select? Only the fittest must survive. Now, the point is, to know how to prevent the dissemination of bad blood in the corn crop when the pollen flies. I believe that if we can devise some way by which we can control impregnation in the corn-field as thoroughly as we can in the herds of cattle, and sheep, and swine, then we shall be in the way of securing more uniformly good crops with our present good cultivation. We shall, with a well-bred seed corn be encouraged to give better care, because with it will come better rewards.

Excuse my long epistle, and accept my assurance of kindly interest in your work, and best wishes for your eminent success.

Yours very truly,

L. N. Bonham.

REPORT ON INSECTS.

In presenting the following report upon some of the most prominent and troublesome insect enemies found in the State, the Director has aimed to simplify the matter as much as possible. Only a few of the many hundreds of injurious insects are mentioned; the descriptions are given in common terms, and the remedies are such as our own experience has proved practicable. The average absolute loss to the State of Ohio from insects can be estimated at millions of dollars per annum. The loss of fruit and vegetables alone by this cause is enormous. In many localities where the peach and plum once flourished they are no longer grown. Apples and pears are sadly injured, and the trees are destroyed by scores. Among the small fruits, each has one or more destructive insect foes.

Injurious insects are on the increase, and if we do not fight them more effectively they are in a fair way to conquer us. Many there are who do not realize the danger that threatens, because they have not yet felt the evil. Some appear to measure the magnitude of the danger by the size of the enemies. If it were only true that their numbers were as insignificant as their size, indifference might be justified. But such is not the case. Insects come in countless millions. They swarm upon our crops. We are doomed to wage relentless warfare against them, or they will drive us from the field. Whatever may be the causes for the rapid multiplication of our enemies, we know they are upon us. We know that their destruction means work. We would like to destroy them by an edict, or suppress their ravages by an act of the Legislature, but this cannot be done. It can only be accomplished by an earnest, united effort on the part of all who raise farm, orchard, or garden crops. It is hoped that this brief report will at least be suggestive, and that those who suffer from insect pests may be incited to try some of the remedies recommended.

CAUSES OF INSECT RAVAGES.

There can be no doubt that insect ravages are *largely* due to the unhealthy, unthrifty condition of the great portion of our cultivated plants. This weakened state has been brought about by our abuse and exhaustion of the soil, by careless breeding, bad culture, and by the severities of our climate.

Another cause of insect devastation is the reckless destruction and growing scarcity of our birds.

In order, therefore, to correct and remove the causes which so largely incite the multiplication of injurious insects, we should, first of all, aim to do two things, viz.:

(1). *Raise nothing but strong, healthy, vigorous plants.* It can be laid down as a general proposition that insects rarely attack perfectly healthy plants. It is the weak, sickly plants upon which they thrive. Plants do not always look unhealthy because they are attacked by insects, but the attack is more frequently made because the plant is unhealthy.

(2). *We must protect and encourage our birds.* They are our best allies in fighting insects, and should be cherished with a watchful eye. Robbing birds' nests or shooting birds should be made a trespass, punishable with fine and imprisonment.

SPECIAL REMEDIES.

There is almost no end to the remedies that have been recommended. Some are good, many are useless, and some worse than useless. Insects have never been destroyed by magic, and seldom by any patent nostrum. Most of the so-called "Insect Exterminators" are humbugs. The essential requisites of a practical remedy are as follows:

(1). *It must be effectual.* That is, it must either prevent the ravages, or kill the insect to which it is applied.

(2). *It must be of easy application.* A remedy that is so complicated that it cannot be readily prepared, or applied, or one that requires undue care and attention, is not likely to be very reliable.

(3). *It must be of moderate cost.* A remedy may be effectual, and of easy application, and yet if it costs as much or more than the crop upon which it was used is worth, it is certainly not practicable.

(4). *It must be harmless to the plants to which it is applied, and to those that use them.* Many of the best remedies are active poisons. If they poison the plant as well as the insect, or poison those who use the plant, or some part of it, for food, the remedy is not a practical one.

CLASSIFICATION OF REMEDIES.

Special remedies may be divided into two general classes: I. *Those whose aim is to kill the insect in some of its stages.* II. *Those which repel or drive away the insect* The remedies which come under each of these two divisions may be subdivided as follows:

I.—REMEDIES THAT KILL.

(1). Applying poison to the food plant.
(2). Applying poison to the body of the insect.
(3). To entrap, or kill by mechanical means.

II.—REMEDIES THAT REPEL.

(1). Applying some agent that renders the plant obnoxious to the insect.
(2). Making use of some impassable barrier.
(3). By varying the time of planting.
(4). By increasing the vigor of plants by better culture.

Before considering these several remedies more in detail, let us recall the four different stages of insect life.

DIFFERENT STAGES IN INSECT LIFE.

Insects exist first as *eggs*. From the eggs hatch the larvæ; this is that form of the insect which receives the common name of caterpillar, grub, maggot, slug, borer, etc. It is in this stage that most of our insect enemies do their greatest injury, spending their time in eating and growing. When the larvæ become full grown they change their form, and become motionless for a greater or less length of time. In this, the third stage, they are called *pupæ*.

After a time these burst their skins and come forth, and we have the fourth stage, or the *perfect insect*. From these come the eggs for another brood, which pass through the same changes. The four stages, then, are these: first, the egg; second, the larvæ; third, the pupæ; fourth, the perfect insect.

In many insects these changes are well marked, and such are said to undergo a *complete* transformation. In other cases, however, the larvæ which hatches from the egg bears a pretty close resemblance to the perfect insect, except in size. This is well seen in plant-lice and grasshoppers. All such insects are said to undergo an *incomplete* or *partial* transformation.

CLASSIFICATION OF INSECTS.

All the different species of insects are divided into seven quite distinct groups, called *sub-orders*. These may be briefly characterized as follows:

(1). *Hymenoptera.*—Four membranous wings; mouth furnished with jaws; transformation complete. ***Bees, Wasps, Ants.***

(2). *Lepidoptera.*—Four minutely scaly wings; no jaws, mouth furnished with a sucking tube; transformation complete. ***Butterflies, Moths.***

(3). *Diptera.*—Two membranous wings; no jaws, mouth adapted for piercing or sucking; transformation complete. ***Flies, Mosquitoes.***

(4). *Coleoptera.*—Four wings, the outer pair hardened, forming covers for the inner membranous pair; mouth furnished with jaws; transformation complete. ***Beetles.***

(5). *Hemiptera.*—Four wings, both pairs membranous, or the outer thickened at base; mouth adapted for piercing; transformation incomplete. ***Bugs, Seventeen-year Locusts, Plant Lice.***

(6). *Orthoptera.*—Four straight wings, the outer pair somewhat thickened; mouth furnished with jaws; transformation incomplete. ***Grasshoppers, Crickets.***

(7). *Neuroptera.*—Four membranous wings; mouth furnished with jaws; transformation complete or incomplete; body generally elongated. ***Dragon Flies, "Darn Needles."***

USE OF INSECT FOOD POISONS.

All insects that freely eat the foliage or green parts of plants simply, or feed upon the soft tissue of the leaves, as do many slugs and caterpillars, may be killed by applying poison to the plant, or that part of it which they eat. By so doing they partake of the poison and are destroyed. For all such insects, then, we have only to name the best and cheapest poison, and the most effective and simplest means of applying it.

PARIS GREEN.

Paris Green has for a long time stood at the head of the list of insecticides. Owing to its virulency, as a poison, however, its use cannot be universal. Upon many vegetables, upon bearing vines and fruit-trees, it cannot be used with safety, except very early in the season. As a remedy for the potato-beetle and many other destructive insects, it has been found almost invaluable. It is especially applicable for destroying caterpillars, slugs, canker worms, etc., insects which often work such injury to our trees and shrubbery. The bright green color of this poison and its insolubility, add greatly to its value, and render safe its careful use. A great mistake is often made by applying this poison with a far too lavish hand. Its principal use is to poison the food of the insect. It is not the direct application to the insect's body that renders it effective, but placing it upon the plant food of the enemy in such a manner that they eat some of it, is certain destruction. Where too much is applied it acts as a repellent. Hence a mild solution or mixture is often more effective than a stronger one. Besides, it is cheaper, and less likely to injure the plant.

LONDON PURPLE.

Another arsenical poison, called London Purple, is now largely used. This poison is a residuum obtained in the manufacture of certain analine dyes. It is rendered fit for use by the addition of lime and carbonaceous matter, after which it is thoroughly dried, powdered, and finely bolted. It was given a thorough trial at the Station last year, and its merits carefully compared with Paris Green. From the tests made it seems to have the following advantages: It is cheaper, purer, finer, and possesses greater adhesiveness. In some ways its purple color is also in its favor. Used of the same strength as Paris Green, it appeared to injure tender plants, like cucumbers, less.

METHOD OF APPLICATION.

The above mentioned poisons may be applied in the dry form or with water. The best results at the Station followed their mixture with plaster or gypsum, in the proportion of one pound in one hundred. This was thoroughly dusted on the plants when they were wet with dew.

With water, a tablespoonful of the poison may be used to four gallons.

As both Paris Green and London Purple are but silghtly soluble in water, care must be taken to keep the mixture well stirred, otherwise the poison will all settle to the bottom of the vessel.

WHITE HELLEBORE.

White Hellebore is a vegetable poison, made from the roots of a plant, the *Veratrum album*, which grows abundantly in Southern Europe. It is less dangerous and in some cases more effective than Paris Green.

One ounce of the powder to five gallons of water is about the right proportion. Our experience has shown it to be a specific for the currant worm, and various other slugs that attack small fruits.

A strong solution of copperas makes a valuable insecticide. We experimented quite carefully with this the first part of the season and found it very efficient in many places.

An insecticide known for many years past as "Persian Insect Powder," and now sold under a great variety of names, and with an equally great variation of quality, is now being manufactured on a considerable scale in this country. It is the pulverized flower heads of different varieties of Chrysanthemum and closely allied plants.

POISONS APPLIED EXTERNALLY.

There are many injurious insects that do not eat the tissue of plants but simply suck the juices. While we cannot destroy such insects by any food-poison, we can often kill them by some external application. Among the best appliances for accomplishing this purpose, are a strong suds of whale oil soap, tobacco-water, a weak solution of carbolic acid, kerosene, or crude petroleum. Any of the above substances and many others are very efficient in fighting cabbage worms, plant lice, and similar insects—acting sometimes as internal poisons as well as external irritants.

Lime, ashes, fire soot, and dust from the road are destructive to some insects. These agents are also valuable as a means of preventing egg-laying.

Washing the trunks of young apple-trees with soft soap suds, about the first of June, and again a month later, is one of the very best means of keeping the borers from depositing eggs. Spraying or sprinkling fruit-trees with a solution of Paris Green, or strong soap suds seems to effectually repel the codling moth.

HOW TO APPLY POISONS.

To use liquid mixtures or solutions in a small way in the family garden, a common sprinkling or watering-pot, with a fine rose serves a good purpose. In nearly every instance the perforations of the rose are too large and the shape too *convex*. The holes should be small, and the rose *flat* or slightly *concave* in shape.

If solutions are to be used on a large scale, as in the case of a field crop of potatoes, some of the many patent devices should be used. Ruggles' Exterminator is a good one.

With this apparatus an acre of potatoes can be sprinkled in an hour. It consists of a box which is strapped on the back of the person using it. An agitator which works upon the inside keeps the mixture well stirred, and is moved by the operator's arm. From either side of the bottom of the box or tank, come two rubber hose, each with a fine sprinkler or rose at the end. One of these is held in each hand so that two rows are sprinkled at once, the operation being performed just as rapidly as a man can walk. There are other slightly different forms equally well adapted for the purpose. The Station used one last year which came from S. H. Fox, of St. Louis, Mo. It divides the liquid into a perfect spray, and for this reason is more economical than some of the other forms, preventing all waste of the poison.

TRAPPING INSECTS.

The habit that some insects have of hiding under boards, chips, or rubbish, furnishes a key to the best means for their destruction. Squash bugs, cut-worms, and other insects that are nocturnal in their habits, may be captured in this way. If balls of fresh clover or green grass be placed where cut-worms are at work they are pretty sure to crawl into them and can be easily destroyed. Chips or shingles placed upon the ground close to squash vines will entrap this garden pest in the same way. This remedy can only be used with success where perfectly clean culture is practiced.

THE PESTS OF THE VEGETABLE GARDEN.

THE ANTHOMYIAN FLIES.

During the past year we have been seriously annoyed by two or three species of these flies, commonly known by the names of the "Cabbage Fly," "Radish Fly," and "Onion Fly." The former caused the almost utter ruin of our early cabbage crop, and the second one named seriously injured our radishes.

These three flies are hardly to be distinguished, the one from the other, and are closely allied to the common horse-fly, except being much smaller. They are ash colored and make their appearance in early spring. The eggs are laid upon the stems of cabbages, cauliflowers, radishes, etc., close to the ground. They soon hatch and the little whitish grubs or maggots work their way down the stem and commence to feed upon the fine rootlets. The ravages of the insect are soon detected, for the affected plants soon cease to grow, the leaves assume a yellowish, unthrifty color, and wilt badly under a hot sun. Not unfrequently the plants are killed outright, but more often they linger along, and sometimes the roots become enlarged and mal-formed.

We have tried many different remedies but none of them proved entirely successful. The following have given the best results: First—An application of lime, salt, and ashes to the soil before transplanting the cabbages. Second—Dipping the roots of the plants in lime-water, and dusting them with bone-flour before setting them in place. We saved a large number of plants after they were attacked, by making in the ground close by the root, a little hole with a dibble, and filling it with lime-water. While none of the above are specific remedies, they tend to check the insect. Perhaps the most efficient preventive measure is to have an abundance of lime in the soil. This is not only congenial to the growth of the cabbage, but is almost certain destruction to the larvæ of the cabbage-fly. Along the seashore and for some distance inland, there is often a large admixture of oyster, clam, and other shells in the soil, and where this condition exists, the cabbage is raised in the highest degree of perfection. Probably there is no crop where lime is more indispensable.

STRIPED CUCUMBER BEETLE.

(*Diabrotica vittata*).—These well known insects make their appearance in the Spring, feeding upon other plants until cucumbers come up. The beetles do much damage to young cucumber vines, but the larvæ are also very injurious, burrowing as they do into the roots, causing the death of the vine.

Remedies.

If the young vines are covered with boxes, open at the bottom, and covered with millinet on top, the insects may be kept off for a time. Paris Green and Hellebore are effectual. If the vines are kept free from the beetles of course there will be no grubs to burrow in the roots. A very dilute solution of Paris Green must be used, or the vines are certain to be injured. Dusting the vines with lime, ashes, soot, etc., can be recommended

SQUASH VINE BORER.

(*Aegeria cucurbitæ*).—The moths are orange colored, spotted with black; about three-fourths of an inch in length, fore wings black, hind wings transparent. The eggs are deposited near the base of the stem during July and August. These soon hatch and the larvæ penetrate to the interior of the stem, and the damage done soon becomes apparent by the sudden wilting of the vine. The larvæ soon enters the soil and forms a cocoon. The moth comes out the next Summer.

Unless the vines are watched closely the injury is done before the cause is suspected, and is discovered too late to apply any remedy.

Evidently the only plan is to use preventives.

The moths can be caught, and the eggs gathered and destroyed. Some have practiced covering the vines at different parts with dirt, so as to allow the vine to root in several places; thus a part of the vine may escape.

The vines should be pulled up and burned as soon as affected. This must be done before the larvæ leaves the stem, or it will avail nothing. The plan of covering the lower part of the stem, as advised with peach trees, is recommended, and might be practiced if some easy and cheap method can be devised. We saved a few plants at the Station last season whose unthrifty condition plainly showed that these insects were at work, by making a hole in the soil with a pointed stick, close to the roots of the plant, and into this pouring lime-water. This certainly proved fatal to the borers in some cases and appeared to be harmless to the plant. We tried some bi sulphide of carbon in the same way, but the results were not favorable.

MAY BEETLE, OR JUNE BUG.

(*Lachnosterna fusca*).—This is the beetle that lays the eggs which produce the well known white grub, that is so often destructive to strawberry plants, young nursery stock, grasses, and many other plants.

The beetle is nearly an inch in length, of a chestnut brown color, and covered with small dots that look as though pricked with a pin. The beetles come during June, and are often quite destrnctive to the foliage of trees, which it eats during the night, as it is nocturnal in its habits. The female enters the earth a few inches and deposits her eggs, thirty or forty in number, which hatch in about a month. The grubs continue to live and grow three years, living upon the roots of almost any plant which is within their reach, eating the roots off near the surface. The third year they form a little chamber or cocoon in the earth, and assume the pupæ state. In May or June the change is completed, and they come forth as perfect beetles.

Remedies.

Various substances have been proposed as applications to the ground, for the purpose of killing, or driving away the grubs, but it is doubtful if anything can be applied in sufficient quantity to effect this without killing the vegetation. Salt is often recommended, but it is probable that where its use has apparently been beneficial, the grubs were just ready to assume the pupæ state. Skunks and moles do much good in destroying these pests, and it is greatly to the interest of the farmer to discourage the unnecessary slaughter of skunks, now so common.

Where the grubs are not too numerous, in strawberry beds, something can be accomplished by killing all the grubs found where plants have wilted. This is a much better remedy than may at first be supposed, if it is faithfully carried out.

Thorough cultivation will also accomplish much. The beetles may be trapped by shaking the trees on which they are found, early in the morning, and catching the beetles on sheets and then destroying them.

Lanterns are sometimes placed over tubs of water, so that the beetles when attracted by the light, will strike the lantern and fall into the water.

Some have supposed that a white grub found under manure heaps is the same as the one above mentioned; while others have confounded the common Tumble Bug, which lays its eggs in manure and then rolls it into a ball, to be identical with the May Beetle. Such is not the fact, however, as both are very unlike the white grub which comes from the May Beetle and are harmless.

CUT WORMS.

(*Agrotians*).—There are several species of these worms that are injurious.

The moths are gray or brown, and fly mostly at night, late in summer. The worms feed at night and remain in the soil during the day.

Remedies.

It is not easy to find any very effective remedy, but killing the worms whenever found may help somewhat.

It is recommended to wind stiff paper around the stems of cabbage and tomato plants when they are set out, but we have not found this practicable.

The plow and cultivator expose many of these worms, and birds, if encouraged, will render much aid in their destruction.

Quails are especially useful in this respect and should be protected.

There is a species of cut worm which has the habit of climbing trees in the night time and feeding upon the fruit and leaf buds. They are especially fond of the pear, apple, and grape, but attack the raspberry, currant, and other trees and plants.

Dwarf trees seem to be particularly subject to their depredations.

Very many times newly planted trees are killed from this cause and the mischief attributed to birds or other agencies.

The best remedy, and one which is quite effectual, is to enclose the base of the tree in a tin tube, which should enter the soil about an inch and extend above the ground about six inches. This effectually checks them and is easily applied when they are known to be at work.

PEA WEEVIL.

(*Bruchus pisi*).—This beetle is about one-eighth of an inch in length and of a rusty black color. As soon as the young pods form, the female lays her eggs in incisions made in them. When the eggs hatch the larvæ penetrate through the pod into the peas, feeding upon the albuminous part of the pea, usually leaving the germ untouched. The larva continues to eat and grow until the pea ripens, at which time there is only a very thin shell left covering the cavity which has been formed.

The larvæ changes to the pupa state within the pea, but does not usually emerge as a beetle until the spring following. Hence late sown peas are not much subject to heir attacks as early ones.

Remedies.

Unfortunately there are no practicable remedies, unless by concerted action every one should burn every infested pea. Peas with bugs in them should not planted. Although they may sometimes grow, they do not produce so vigorous plants and of course help to propagate the pest.

BEAN WEEVIL.

(*Bruchus fabae*).—This resembles the pea weevil in habits, but is much smaller. It deposits a greater number of eggs and usually completely destroys all the beans which it enters. Of course all infested beans should be rejected and not used for seed.

STRIPED FLEA BEETLE.

(*Haltica striolata*).—This beetle is very small, being less than one-tenth of an inch in length. It is of a shining black color, very active, and coming in swarms. It is very destructive to young seedling vegetables; radishes and turnips being especially susceptible to its attacks.

Remedies.

Among a host of remedial agents soot and fine ashes collected from the flues of boilers and dusted upon the plants in the morning, while the dew is on, has given the best satisfaction. Air-slaked lime is often recommended, but does not prove so efficient as the remedy just mentioned.

ASPARAGUS BEETLE.

(*Crioceris asparagi*).—The beetles are beautiful bluish black insects, about one-fourth of an inch long; thorax reddish-brown; wing-covers yellow. They pass the Winter under sticks and rubbish, and come forth in the Spring, and lay the first brood of eggs in May.

Several broods are produced in one season. In June the larvæ are large enough to attract attention, and resemble the Colorado potato beetle larvæ in form, but are of a grayish color. Both the beetle and larvæ feed upon the young asparagus shoots, doing much injury.

The beetles drop from the plant and feign death when disturbed, but the larvæ cling tightly to the plant and eject a disgusting black fluid, which seems to be distasteful to birds, and makes the asparagus very unpleasant to handle and renders washing necessary.

Remedies.

Hand picking can be resorted to only on a small scale. If all the shoots are cut before the eggs hatch, and those that are unfit for use burned, there will, of course, be no second brood of beetles. Should any escape, however, lime can be dusted over the plants, when wet, later in the season. It serves to keep the larvæ in check, but has little effect on the beetles.

Lime cannot be used to advantage early in the season, when the crop is being marketed, but if care is taken to let as few of the first brood hatch as possible, and lime used on the second brood, the pest may be kept in hand.

ROSE BUG.

(*Melolontha subspinosa*).—The beetle is about one-third of an inch in length, and is covered with yellow down.

They appear in June and remain about a month, laying their eggs from one to four inches beneath the surface of the soil. The eggs hatch in about twenty days, and the larvæ begin feeding upon young and tender roots within their reach. In autumn they descend below the reach of frost, and in June, having passed the pupa state, they emerge as beetles. It is as beetles that they prove most injurious, and in this state they are most easily combatted.

They seem to prefer roses, but when plentiful they extend their depradations to many other classes of plants, such as grape vines, fruit trees, and vegetables.

The Ox-eye Daisy seems to be a favorite with them, which offers a hint as to the advisability of fighting two enemies at once, by cutting and burning the weed and destroying the bugs at the same time.

They are not affected by the applications which are used to destroy many other insects, so that hand-picking, shaking, or some mode of gathering and destroying must be practiced. When very troublesome they can be shaken on to sheets and then burned or scalded.

Plowing the ground in Winter is sometimes quite effectual, and may perhaps be practical, provided they are known to be present.

THE SQUASH BUG.

(*Coreus tristus*).—This well known insect is readily recognized by its dusky color above, and ochre-yellow beneath. Its odor is very disagreeable, and in many localities it receives the common name of "stink-bug." The perfect insect lives through the winter and about the time the melon, squash, or pumpkin vines have fairly started, it is seen feeding upon the leaves by day and hiding under some sod or rubbish at night. The female deposits her eggs in clusters on the underside of the leaf. These are *brownish* in color and not very readily recognized. They soon hatch and the grayish green larvæ begin their work of destruction. They injure the plants by sucking the juices.

Remedies.

The habit that this insect has, which has already been alluded to, of seeking some shelter or hiding place at night, suggests the best means of capturing them. If pieces of shingles, chips, or leaves are placed on the ground near the vines, many of the bugs will crawl under them at night. All such can be readily killed in the early morning.

Efforts should be directed towards capturing just as many of the beetles as possible before any eggs are laid. Something can also be done by destroying the egg-clusters, which a careful search will not fail to reveal.

THE CABBAGE BUTTERFLY, OR GREEN WORM.

(*Pieris rapæ*).—This pest is too well known to require any extended description. It was imported from England and made its first appearance on this continent in the vicinity of Quebec, in the year 1859. Since then it has rapidly spread South and West, and has now spread over nearly the whole United States. This butterfly is white, with black spots upon its wings. The eggs, which are of a green color, are glued fast to the surface of the leaves, and are rather hard to find. They hatch in a short time, and the larvæ feeds upon the leaves. The worms or caterpillars are of a pale green color, finely dotted with black. When mature they are about one and one-quarter inches in length. This butterfly is double brooded. The first brood appears quite early in Spring, the latter sometime during June or July.

The second brood is the most injurious, for they not only eat the outside leaves, but often work their way right into the very heart of the cabbage.

Remedies.

A large number of remedial agents have been recommended. During the past season we tested the following: lime-water, tar-water, copperas solution, whale-oil soap, brine, powdered tansy, tobacco-water, and pyrethrum, or Persian Insect Powder. The last named proved to be the most effective. It was used in the form of a powder and also as a solution. When used in the form of a powder it should be mixed with about twenty parts of flour. Buckwheat flour is the best. Used with water one tablespoonful is sufficient for twelve quarts. A single application, where the powder is good, and carefully put on, is sufficient.

INSECT ENEMIES OF THE FRUIT-GARDEN AND ORCHARD.

STRAWBERRY WORM.

(*Emphytus maculatus*).—These worms are the larvæ of a small black fly, which has two rows of dull whitish transverse spots on the abdomen.

The female deposits her eggs in the stalks, which she punctures by means of a saw-like instrument.

The eggs hatch in about two weeks, when the young worms immediately attack the leaves, eating small holes, and doing much injury when abundan. The leaves, with small holes gnawed into them, often become quite noticeable although the worms may not be found without considerable search, as th fall to the ground when disturbed. The worms are dirty yellow or greenish, and a little more than half an inch long. When not feeding they are usually curled up in a spiral form on the under side of the leaf. After changing their skin four times they descend into the ground and form a cocoon of earth. They produce two broods during the season; the second one descending during August and remain until April, when the fly emerges and commences laying eggs.

Remedies.

Dusting the leaves with lime, when wet with dew, or after a rain, is said to be good. Hellebore is quite effective, when dusted over the plants.

STRAWBERRY LEAF ROLLER.

(*Anchylopera fragariæ*)—The moths deposit their eggs in July on the leaves, where they hatch in a few days. The second brood, in the fall, descend into the earth where they remain all winter in the pupa state. The worms roll themselves up in the leaves, and thus are quite difficult to reach, being more or less protected from any application that may be made. A few may be destroyed by sweeping the leaves with a stiff broom; the most effective remedy is to scatter straw over the plants after picking and burn. If too much straw is not used no harm will be done to the plants.

THE SNOWY TREE CRICKET.

(*Oecanthus niveus*).—This cricket seems to prefer the Raspberry, in which it deposits its eggs in a compact row in the pith of the twig. This causes the twig to break off and sometimes does considerable injury in old plantations. This insect also cuts the leaves off from grape vines, and sometimes bunches of grapes.

If the trimmings of raspberries are burned something will be effected in checking this insect.

If it is desired to keep a plantation of raspberries several years it is well to destroy as many of the eggs as possible, which can be done very easily if some care is taken in pruning, to cut away all twigs that are stung.

RASPBERRY BORER.

(*Agrilus ruficollis*).—The small coppery colored beetle deposits its eggs in June and July. The larvæ bores into the canes, causing galls which finally kill the canes. Although not as yet very destructive, it is well to be on the lookout, and where observed, the injured canes should be cut and burned. Blackberry bushes are also infested with this and other borers. These borers may become quite troublesome if left to increase unchecked.

CURRANT WORM.

(*Nematus ventricosus*).—This is the larvæ of a Saw fly which appears soon after the Currant and Gooseberry bushes leaf out, and the eggs are deposited on the under surface of the leaves along the veins. The eggs soon hatch into a pale colored larvæ, which soon becomes green, with black spots on the body and a black head, and attains a length of about three-fourths of an inch. They leave the bushes after attaining full size, and spin a cocoon below the surface of the ground or under leaves. There are usually two broods in one season, the fly appearing again in June or July, but the second brood remains in the pupa state until the next spring.

There is another species called the Native Currant Worm, which differs from the preceding in appearance and habits, but the same remedies may be used for both.

Remedies.

White Hellebore, which can be obtained in the powdered state, is an efficient remedy. Care must be taken in handling it not to breathe it, as it causes violent sneezing. It may be sifted over the bushes when wet with dew, or a still better plan is to dissolve it in hot water and apply with a sprinkler. The powder may be dissolved to best advantage by pouring warm water slowly over it, stirring at the same time. A tablespoonful to a pail full of water is sufficient.

THE PEACH TREE BORER.

(*Aegeria exitiosa*).—The moths are dark blue—the male being much smaller than the female, and they differ also in other respects, the male having all four wings transparent and veined with blue, while in the female the fore wings are opaque and the hind transparent.

The eggs are deposited during the summer at the base of the tree, and after hatching the grubs bore through the bark and feed upon the sap wood and inner bark. They go through their transformations in a year.

The exudation of gum at the base of the tree is an indication of the presence of the borer, and whenever found should be cut out, or a probe of some kind used to crush them.

In the spring the trees should be examined; all borers and cocoons destroyed, which will necessitate removing some of the earth from around the base of the trees. Heavy sheathing paper, eight or nine inches wide, is then put around the tree next to the ground. Fresh mortar is then put around outside of the paper and the remaining space filled in with soil.

Young trees from the nursery often have borers in them, which should of course be removed before the trees are planted.

Sometimes the borer works higher up the tree at the forks of the limbs, but does not usually do much harm, except near the surface of the ground.

THE CURRANT BORER.

(*Aegeria tipuliformis*).—This is an imported insect that is now proving quite destructive to currants in many parts of the United States. It also attacks the gooseberry, though less frequently. The perfect insect is a moth, nearly one inch in length, with a wing expansion of three-quarters of an inch. Its color is blue, with yellow bands or markings. The moths make their appearance during the month of June. They lay their eggs upon the stems of the currant bushes, usually near the base of the bud. The eggs soon hatch, and the little worm or caterpillar bores its way to the centre of the stem, and there feeds upon the pith. It remains in the stem about a year, when it becomes full-grown, changes to a pupa and emerges as a moth.

Remedies.

The presence of the borer can usually be detected by the yellowish, unthrifty appearance of the leaves upon the affected stems. All such stems should be at once cut out and burned. Thoroughly washing the bushes with lye or soft soap suds appears to be a good preventive remedy. Where currants are trained in the bush or stool form less serious injury is done than where they are trained in the tree form, with a single stem.

THE CODLING MOTH.

(*Carpocapsa pomonella*).—This is probably the worst enemy of the apple, and the annual loss sustained by its ravages is enormous. The perfect insect is a small moth, of grayish brown color. It makes its first appearance about the time apple-trees are in bloom. It is nocturnal, hence seldom seen. The moth commences to lay eggs as soon as the young apple is set. These are laid singly, as a rule, one egg to the apple, on the blossom or calyx end of the fruit. Each female moth lays from 200 to 300 eggs.

The eggs, which are small and yellow in color, hatch in from five to ten days, and the young larvæ or worm eats its way to the centre of the apple. The full-grown larvæ, or apple-worm, as it is often called, is known to almost every one. While young it is yellowish white, with a black head. As it reaches maturity it becomes slightly pinkish in color. It varies from one-half to three-fourths of an inch in length. It attains its full size in from 20 to 30 days. It then leaves the apple and seeks some secure hiding place in which to spin its cocoon.

Some experiments with different varieties of apples indicate that about one-half of the worms leave the apples while they still hang upon the tree. The others fall to the ground with the apple. In either case the worm usually seeks to hide under the rough bark of the tree. Here it spins its silky, papery cocoon and passes into the pupa state. These cocoons can be readily found by a little careful search. They are usually more or less covered with minute particles of bark. The inside is of pure white color. The insect remains in its cocoon from nine to fifteen days, the time depending upon the temperature, when it comes forth a perfect moth. These deposit their eggs upon the partially grown apples, just as has been described for the first brood. The second brood is much more injurious than the first. The time of maturity of the larvæ is much more variable. Some of the worms remain in the apple until winter. The most of them spin their cocoons sometime during late summer or fall.

Remedies.

There are two practical remedies. One kills the enemy by entrapping them. The other acts more in the nature of a repellant. The habit that the worms have of seeking a secure hiding place under the bark, furnishes a key to one of the best means of destroying them.

All that has to be done is to destroy their natural hiding places by removing the rough bark and keeping the ground about the tree free from all rubbish, and then furnish them some artificial hiding place where they can be readily killed. The best trap is a band of paper, about four inches wide, passing once around the tree, about midway between the ground and branches, and secured either by tacks or by tying a single cord tightly around the center. Bands of woolen cloth are better, but more expensive. Whatever form of band is used should be applied about the time of the ripening of the first Wilson strawberries, and then examined carefully at least once a week until the first of September After this date it is unnecessary to make but one examination, which should be done just before winter sets in. In addition to the bands, wherever possible, apple orchards should be pastured with sheep or hogs. These should be kept numerous enough, and hungry enough to eat all of the fallen fruit. While this use of sheep and swine is only a partial remedy, they have been found to be very important aids. Inasmuch as some of the worms remain in the apples until winter, and only leave them after they have been stored in cellars or fruit-houses, the packages, bins, and whole store-room should be thoroughly examined in early spring, and the cocoons which may be found in crevises and corners should all be destroyed.

The second remedy is to spray or sprinkle the trees with a solution of Paris green or London purple. This is a cheaper, more simple, and, if thoroughly done, just as efficient a remedy as the use of the bands. Either of the above poisons mixed with water at the rate of one pound to one hundred gallons is effectual. The application should be made soon after the fruit sets, the last of May or first of June. By placing a close barrel of the liquid in a wagon, and then using a force pump, the application becomes very easy and rapid. The Whitman Foundry Pump, manufactured at Providence, Rhode Island, by A. J. Whitman, is one of the best.

THE ROUND-HEADED APPLE-TREE BORER.

(*Saperda bivittata*).—There are two quite distinct and very different species of insects known by the name of "Apple-tree Borers." We will briefly describe both. The better known, and usually the more injurious, is called the "Round-headed Borer." The perfect insect, which makes its appearance the latter part of May or first of June, is about three-fourths of an inch in length. It may be easily recognized by the two white stripes on the upper side of the body, alternating with three of a light brown color. The face, the under side of the body, and the legs are white. This beetle flies mainly at night, the female depositing her eggs on the trunk of the tree near the ground. In two weeks the eggs hatch, and the young worms commences eating into the bark. It remains nearly three years in the tree as a borer. During the first year it does but little damage, living mainly upon the inner bark. By the end of the second winter, when half grown, it is usually found boring into the solid wood. Before reaching maturity it frequently makes tunnels a foot or more in length. It ceases feeding upon the wood at the beginning of the third winter, and changes into a pupa the following spring. It remains in the pupa state about three weeks, when it changes into a soft beetle, which soon cuts its way through the bark, leaving the tree through a perfectly round smooth hole. Many valuable trees are ruined by this insect before they are detected. The borers leave their saw-dust like chips behind them, and these accumulate so that they are usually pushed out of the hole by which the borer entered. If the ground around the base of the tree is kept free from all rubbish, they can usually be detected by this means.

Remedies.

Washing the trunks of the trees the latter part of May and again the last of June with some stong alkaline solution, will prevent the female from laying her eggs. Soft soap applied with an old broom is probably the very best wash that can be used. Besides making the tree obnoxious to the beetle, this wash keeps the bark in a thrifty condition. Lye is sometimes used in the place of soap, but the soap itself is a much more effectual preventive. The regular washing of the trees should be supplemented by a careful examination, and wherever the borers are found at work they should be cut out with a knife. By thrusting a wire into the hole we can destroy the enemy without marring the tree so badly. The month of September is, perhaps, the best time to go through your orchard, and if the work is carefully done, in connection with the application of soap already referred to, there is little to be feared from this pest.

THE FLAT-HEADED BORER.

(*Chrysobothris femora*).—While this insect is not so widely distributed or so generally injurious as the one just described, it is working serious harm to young orchards in many parts of the State. The perfect insect is a coppery-brown or greenish black beetle, about one half of an inch in length. The eggs are laid in June on the bark of the trunk and the larger branches, usually upon the south side. The eggs soon hatch into minute worms, which have very large flat heads, whence the common name. The borer remains in the tree but a single year, and is generally to be found between the bark and the wood. This insect rarely attacks healthy vigorous trees, but the weakened condition of the apple-trees in many parts of Ohio, owing to the unusual severity of the winter of two years ago, has made them extremely susceptible to its attacks.

Remedies.

The remedies are the same as those given for the Round-headed borer, viz.: washing with soap and the use of the knife. The borers may frequently be cut out during July and August. Their presence may be detected at first by a little brownish liquid exudation, and later by the dead appearance of the bark covering their tunnels.

THE APPLE-TREE TENT-CATERPILLAR.

(*Clisiocampa Americana*).—This is too well known to need any description, as it is found in almost every orchard and on every wild cherry tree, the leaves of which it is especially fond. The eggs are deposited in June in rings upon the smaller twigs, but do not usually hatch until the spring following. The caterpillars feed twice each day, in the forenoon and again in the afternoon. They feed about six weeks and then form cocoons from which the moth issues about three weeks later. The cocoons are yellowish white in color, and are found in crevices under rough bark, and sometimes in the old tent.

Remedies.

The nests or tents are conspicuous, and can be destroyed or syringed with coal oil, soap suds, lye, etc., but it is much cheaper to destroy the eggs which can be easily found when the trees are bare. As the worms are very partial to the wild cherry, the eggs will be found most abundantly on those trees, and can be very easily found and destroyed during the winter and early spring. The eggs are sufficiently conspicuous to be easily found after one has become accustomed to looking for them. In case the egg clusters are not found, the nests of young caterpillars should be removed and burned in the spring before they have attained much size. If the nests are out of reach a swab can be made by wrapping rags around the end of a long pole, then dipping this into coal oil or lye and applying it to the tents. A swab prepared as above may be lit and used as a torch burning out the nests.

PLUM CURCULIO.

(*Conotrachelus nenuphar*).—The weevil or curculio is a warty looking brownish beetle, about one-fifth of an inch in length. It has the habit when disturbed of bending its snout under its body and drawing up its legs and remaining some time apparently lifeless. It lays its eggs in the nectarine, plum, apricot, peach, cherry, and perhaps other fruits. It first makes a hole with its jaws and snout, then deposits an egg which it pushes down into the hole with its snout, after which a crescent-shaped incision is made around the place where the egg was deposited. In a few days a grub hatches from the egg and commences to feed upon the fruit, which in the case of the plum and apricot, causes them to drop from the tree. The cherry, however, does not usually fall.

The grub leaves the fruit soon after it drops, and entering the ground passes through its transformations in about three weeks and comes out a beetle, in which state it passes the winter under the loose bark of trees, sticks, rubbish, etc.

Remedies.

As the beetle can fly, it is evident that bandages or anything else applied to the body of the tree can avail nothing. Something by way of preventive can be accomplished by gathering and destroying all fallen fruit or by allowing hogs or poultry to run under the trees and eat the fruit as it falls. This will, of course, accomplish nothing the first year, but may in succeeding years. The most effectual remedy is to jar the trees once or twice each day, and collecting all the beetles that fall and destroying them, commencing soon after the blossoms fall and continuing until (in case of plums) the stone becomes hard. Sheets should be placed under the tree on which to catch the curculios, and the tree suddenly jarred with a mallet, which is better than shaking. In order not to bruise the body of the tree, a limb may be sawed off, leaving a short stump, which can be struck with the mallet, or a spike may be driven into the tree for the same purpose. When properly prepared for this kind of work, the trouble is not so great as to make the remedy very costly. There is but little use of resorting to the use of offensive compounds to drive the curculio away, so that the only sure way to get rid of him is to catch and kill him.

THE CANKER WORM.

(*Anisopteryx vernata*).— In some parts of Ohio apple trees are annually stripped of their leaves by the much-to-be-dreaded canker worm. The natural history of this insect is very interesting. The perfect insect is a grey or ash-colored moth, but the two sexes present a very different appearance. The male moth is small bodied and has wings. The female moth has a body two or three times larger than that of the male, and has no wings. These moths make their appearance during the first warm days of spring From letters received from different parts of the State, it is quite possible that some of the moths appear in the warmth of late autumn or early winter. It is also quite probable that a closely allied species has been mistaken for the one here described. The male moth is very active, showing the greatest activity about dark, at which time the females may be readily found climbing up the trunks of the trees.

The eggs which are of a light green color are usually laid in clusters of about about one hundred. They are deposited under the scales of the bark, in cracks in the wood, and very often in the long larva-cases of the leaf-crumpler. The eggs are usually placed near the buds, and when there begin to expand. In spring the young worms may be seen feeding upon the young and tender leaves. When full grown the caterpillars or worms are about one inch in length. In color they are usually grayish or slightly yellowish. They are what are called measuring worms, that is, instead of crawling as ordinary caterpillars do, they move by fastening the fore feet and then bringing the hinder part of the body close up to the head, looping up the body in so doing. It then straightens itself and goes through the same process again, seeming to repeatedly measure its length as it moves along. Each worm is provided with a silk gland in the under lip from which it spins a fine thread of silk by which it suspends itself from the tree when disturbed or frightened.

Remedies.

As the female moth cannot fly, and is obliged to crawl up the tree in order to deposit her eggs where they will work injury, it is evident that if her passage be obstructed, the tree will be saved. How to place a cheap and effective barrier about the tree is the problem to solve. Probably the best substance by which this purpose can be effected is tar. Paper bands about eight inches wide should be tacked around the tree close to the ground. A circle of tar should be smeared around these, which must be renewed as rapidly as it becomes dry. Some have used cheap molasses and printer's ink with good results. If one has many trees to protect, a cheaper and better remedy is to syringe or sprinkle them with a solution of Paris green or London purple, just as has been described for the coddling moth. Shaking the worms from the tree upon a light coat of straw, which is immediately burned, is a remedy practiced with good results in some places. Something may be done in the way of lessening the number of the pests by plowing or digging up the ground about the trees just before frost comes. By so doing many of the pupa are exposed and killed for want of protection. Hogs will help to turn and overturn the soil, especially if pains be taken to scatter a little corn through it.

INSECT ENEMIES OF FIELD CROPS.

THE HESSIAN FLY.

(*Cecidomyia destructor*).—Judging by the number of letters of inquiry which have come to the Station, this insect is committing its ravages in many portions of the State. In view of the importance of the subject we feel justified in giving a somewhat extended description of this formidable enemy.

Origin.

The Hessian fly is of European origin. It received its name from Col. Morgan, of New Jersey, because it it was supposed to have been first brought to America by the same ship that brought the Hessian troops. It was first observed in the vicinity of New York City in the year 1778. Starting from this point it has spread in different directions at the average rate of about twenty-five miles a year. In 1845 it was spoken of as the great wheat pest of Michigan. In 1860 it was ravaging the wheat fields of Iowa and Minnesota.

Natural History.

The perfect insect is a small two-winged fly belonging to the same sub-order as the mosquito, horse-fly, radish-fly, etc. It is still more closely related to the gall-flies, which produce the excrescences called galls on many differen plants. The Hessian fly is black in color and nearly one-sixth of an inch in length, with a wing expansion of nearly one-fouth of an inch.

The eggs are reddish and oblong in shape; they can, by a little practice, be readily seen with the naked eye.

The larvæ, or little maggot, is of a reddish color when young, but becomes brown as it reaches maturity. It appears capable of motion at first, but after a time appears torpid. It finally shrivels up, and, on account of the resemblance, is said while in this condition to be in the "flax-seed" state. After remaining in this stage for a greater or less length of time the real pupa appears.

Habits.

In this latitude the Hessian fly appears soon after the middle of August, and may be seen in greater or less abundance throughout September. They deposit their eggs upon the surface of the blades of the young wheat plant, where they can be seen in the grooves or creases of the leaf. The fly lays from one to three eggs at a time without change of position; then flying to another leaf the operation is repeated; the eggs are usually laid on the upper surface of the leaf, but not always—they are sometimes found on the other side, and occasionally they may be seen on the stem. The eggs hatch in from four to ten days—depending upon the temperature. The little worm or maggot, which does the injury, works its way down the leaf until it reaches the base of the sheath just above the roots. In about thirty-five to forty days the maggot turns brown and changes into the "flax-seed state."

The presence of the insect is readily detected by the yellowish, unthrifty appearance of the plants. The injury is done not by eating the plant, but by sucking its juices.

During the latter part of April the second brood of flies appear, which are soon ready to deposit their eggs; these are placed on the leaves of the first two or three joints—the eggs hatch and the larvæ work down the sheath of the leaf as before. This spring brood is often quite as injurious as the autumn one; they remain in the wheat plant until July or August, when the fly again comes forth and is ready to deposit its eggs upon the early sown wheat.

Remedies.

The best preventive remedy is late fall sowing. Though it is not always effectual, it can be safely said to be a most valuable method of saving the crop from the enemy's ravages. The weight of testimony proves conclusively that where some wheat is sown early, the late sown in the same locality will escape. If, on the other hand it is all sown late, the fly will delay egg-laying until this late sown crop is in a suitable condition to receive them.

In view of this fact Prof. A. J. Cook, of the Michigan Agricultural College, has suggested an improvement upon the old remedy. He urges the following:

> "Let all, without exception, sow a narrow strip, about each field to be sown, early in September, or even in August. From the fact that the flies are already in waiting, that the outer edge of a field is almost always the most injured, except that the field grew wheat that nourished flies the preceding year, and that such fields suffer most; one may expect this early sown narrow rim to receive nearly all the eggs. Leave the balance of the field till we feel it is dangerous to wait longer, at least till after the middle of September, then sow it, after which plow deeply under the early sown strip, that is, if it is stocked with insects, which may be easily determined by examination, and re-sow it. We should thus kill two birds with one stone—save our crops and destroy the pest."

Another remedy that is often recommended is pasturing or cutting the wheat in spring. This may be done about the first of May, and it is thought that by this means many of the eggs and young larvæ are destroyed. We mowed several plats at the Station last spring that were likely to be seriously injured by the spring brood of flies, and it proved an effectual remedy.

Burning the stubble soon after the wheat is harvested has been suggested, but our best entomologists do not recommend the practice, because it would destroy so many of our insect friends.

Good cultivation, liberal manuring, and the selection of the most healthy, hardy, and vigorous varieties will add much in resisting the Hessian fly. Among the twenty varieties of wheat that were sown in considerable quantity at the Station last fall, it is only the weakest growing and least hardy that show any signs of injury. All varieties of vigorous growth have escaped. White varieties have suffered the most, while the red wheat are nearly exempt. The date of sowing of these varieties was September 20–23. One of the experiments now in progress is a series of trials in early and late sowing of wheat. The first sowing was August 25, and an equal plot was sown each week until the middle of October. To all appearances, the plots sown August 25, September 1, September 8, and September 15, were about equally injurnd by the fly,-careful examination revealing about the same number of larvæ in each. The earliest sown, however, having suffered the most from dry weather, looks the poorest, and will probably yield the least. Only a very few larvæ were found in the plot sown September 22, and the most diligent search failed to reveal any in the plots sown after this date. The variety of wheat used in the above test is Velvet-chaff. We shall watch with much interest the effect of the spring brood of the Hessian fly upon these different plots.

WIRE WORMS.

(*Elaters*).—Many inquiries have been received in regard to these pests during the past year. They have been reported as seriously injuring potatoes, corn and meadow grass. Wire worms are the larvæ of the spring beetles, so named because they have the power of springing in the air when placed on their back.

The worms live for several years in the ground, feeding upon the roots of grass, corn, wheat, and other plants They are often very destructive to early planted potatoes and corn. When full grown, the larvæ are long, slender, hard-bodied, and of yellowish red color, which makes the common name "wire-worm" very appropriate. The beetles, the perfect insect, may be seen coming out of the ground during early summer. These pests have almost ruined the meadows in some parts of the State, and at times prove very destructive in the corn-field.

Remedies.

About the only thing that can be suggested in the way of remedies, is to pursue the same line of treatment as recommended for the canker-worm, white grub, and cut worm, that is, late fall plowing and frequent harrowings. This exposes the worms and gives the birds a chance at them. Applications of lime, salt, or ashes to the soil is also found to be beneficial.

ANOTHER ENEMY OF CORN.

During the past year attention has been called to the yellowish, unthrifty appearance of whole fields of corn in some places, and of patches here and there in other fields. This appearance and condition of the corn has been ascribed to cold, wet weather, "wire worms," and various other causes. Recent investigations by the State Entomologist of Illinois have shown that in some instances, at least, the true cause of the injury is the larvæ of a little beetle, *Diabrotica longicornis* of entomologists. This bettle, which has not yet received a common name, is closely allied to the striped cucumber beetle. It is smaller than this well-known pest, and of different color—being a dull greenish yellow. The perfect insect is frequently seen on the corn-silk, just as the ear is forming; it may also be seen upon the flowers of many of our common weeds. The beetle lays its eggs in the ground near the corn roots. These hatch soon after the corn comes up, and the young larvæ immediately begin feeding upon the roots. The larva attains its full size in the latter part of July or during August. It is a slender, whitish worm, about three-eights of an inch in length. When the beetles are abundant it is probable that they do much injury by feeding upon the silk. The greatest damage, however, comes from the worms which work upon the roots.

Remedies.

As the work of this beetle seems to be confined mainly to those fields where corn has followed corn for many successive years, it is recommended that a rotation of crops would be the best remedy; in fact, this is the only practicable measure known. The habits of the insect being such that it cannot be readily destroyed by any application to the soil or plant.

REPORT ON GRASSES, CLOVERS, AND FORAGE PLANTS.

Early last spring we sowed in small plats about thirty varieties of grasses, six of clover, and quite a number of different forage plants. The seed was sown in rows, and each plat was kept carefully weeded. In this way we expect to test the merits of a large list of varieties. All that do well and appear to be worthy of general cultivation will be tried upon a larger scale and their good qualities duly reported. Among other points the following will be closely observed, viz:

1. Which grasses are the most nutritious.
2. Which will yield the largest amount of feed.
3. Which will best endure drouth.
4. Which do stock prefer.
5. Which are best for temporary and which for permanent pastures and meadows.

MILLETS.

Several different varieties were sown at different dates, to note the influence upon rapidity of growth, yield, etc. These tests will be repeated the coming year.

Several species of the Cow Pea (Dolichos) and the Soya Bean (Soja) grew well; they yielded a large amount of leaves and stems, and, without doubt, will prove valuable soiling and fertilizing crops.

None of the spring vetches or lupines did well.

The Teosinte (*Reana luxurians*) was a source of disappointment. It is a comparatively new forage plant, a native of Mexico; it is reported to be rich in sacharine matter, and highly nutritious; it also has the reputation of being a remarkably rapid and vigorous grower, yielding a large number of cuttings throughout the season. The seeds were started in a hot-bed and then transplanted to the open ground. The roots appeared to strike deep, and great bunches of strong looking shoots showed themselves, giving promise of a great yield. The result, however, was that none of the stalks attained a height of more than twelve or fifteen inches before the frost cut them to the ground.

Prickly Comfrey (*symphytums*) made a good growth, but no variety of stock could be found that was willing to eat it.

It is safe to say, that for central Ohio no soiling crop has yet been found equal to sowed corn, and no fertilizing crop equal to clover.

LOSS OF WEIGHT IN THE CURING OF HAY.

This test was made with two varieties, orchard grass and clover. Each test was confined to one square rod.

First Cutting, June 10th.

Clover weighed green	84	pounds.
" cured	24	"
Loss	60	" 71.4 per cent.
Orchard grass weighed green	126	pounds.
" " cured	41	"
Loss	85	" 67.4 per cent.

The clover was cut just before it began to blossom. Orchard grass had just commenced to blossom.

Second Cutting June 24th.

Clover, green	100	pounds.
" cured	40	"
Loss	60	" 60 per cent.
Orchard grass, green	95	pounds.
" cured	57	"
Loss	38	" 40 per cent.

At this cutting the orchard grass had shed its pollen, and the clover had reached its fullest bloom.

Third Cutting July 11th.

Clover, green	57	pounds.
" cured	25	"
Loss	32	" 56.1 per cent.
Orchard grass, green	52	pounds.
" cured	30	"
Loss	22	" 42.3 per cent.

The orchard grass was dead ripe at this time, and more than half the clover heads were brown.

The grass on the different plots was as nearly alike as could be selected.

The orchard grasses loses very rapidly in green weight as it ripens. The clover shows the heaviest weight when in full bloom, then loses very rapidly.

REPORT ON FORESTRY.

To the agriculturist of Ohio the growing of forest trees, and the preservation, improvement, and extension of existing wood land is a subject of signal importance. Not to speak of the effect upon our climate, the reckless destruction of our timber, without any effort to restore the supply, in compelling those who come after us to pay many times the cost at which we might and should have grown it.

There can be no doubt that this improvidence is *beginning* to seriously affect our climate.

Our springs are failing, our streams are becoming more and more capricious, our winds are becoming more destructive, floods are more common, and drouths are more frequent, more severe, more protracted, because our rainfall is less equable.

To make timber plentiful, and to render our climate more genial, we must, in the first place, *preserve and improve our existing wood land.* 2d. We must reclothe all rugged, broken land, all rocky crests, and steep hill sides, *every acre* that is not cultivated, or is cultivated at a loss, with valuable forest trees. The proportion of land in the State of Ohio that should be constantly devoted to trees is not less than *one-fourth.* It is already much less than this, and the work of destruction still goes on. While the great end and aim of all forest tree culture should be general climatic effect, we must not forget that this end may be accomplished by planting and managing trees for at least *three* distinct and special purposes, viz.: (1.) *For timber.* (2.) *For shelter and protection.* (3.) *For ornament.*

For the first purpose all ravines and hill-sides, every acre too rocky to be thoroughly cleared of stone and plowed, should be devoted to our most valuable varieties of timber-trees. For the second purpose—protecting belts of trees should be planted wherever buildings, orchards, gardens, etc., are exposed to cold sweeping winds. The banks of streams, ponds, open-ditches, etc., may often be so planted with trees that they will be protected from abrasion by floods and rapid currents.

For ornamental purposes—all public roads should be belted with rows of stately, graceful trees, and our school-yards, public parks, etc., should not be forgotten.

In order to preserve, improve and extend our extsting forests, which should be made valuable for timber, we must keep up a constant succession of young growing trees of the best varieties. To do this it is necessary (1) To allow no stock to run in wood-lots for purpose of forage. This should be a rule inflexible and relentless. (2) Greater precautions should be taken against fire. (3) All wood-lots should be thinned moderately and judiciously. They should be *cut out* but never more cut off. All worthless varieties should be removed, while the valuable sorts should be trimmed up so that they may grow tall, forming trunk rather than branches.

For whatever purpose it may be planted, we should never forget that a *good tree* grows as thrifty and surely as a *poor one.* It is wretched economy to preserve every tree good, bad or indifferent, that may happen to be growing upon our land; but, until we see about one-fourth of our ground occupied it should be our aim to rear two better trees for every one we cut down.

Having thus briefly indicated what should be done, the important question yet remains, "How can it be best accomplished?" Among other things the following would aid in bringing about this desired end:

1. The exemption from taxation of a certain percentage of wood-land on each farm.
2. The appointment of. a State Commissioner of Forestry to co-operate with and supplement the work of the Division of Forestry in the National Department of Agriculture.
3. The teaching of Practical Forestry in the Agricultural Department of the State University.
4. The establishment of a State Arboretum where every species and variety of our forest trees could be seen growing and its merits thoroughly tested.

WORK BEGUN.

The Station has begun the raising of timber trees in small quantity. Through the kindness of different friends interested in the subject we received quite a collection of seed which was carefully planted last spring. Many of these failed to grow, others grew well.

The white and green ashes germinated freely and grew about ten inches in height. Black walnuts, collected the previous fall and slightly covered with soil during the winter, grew from twelve to eighteen inches the past season. Catalpas and Locusts made a very vigorous growth. We shall transplant these seedlings this spring, putting some on bottom-land and some on up-land; more seeds will also be sown.

The Station derires to make forest-tree culture a prominent feature. Letters received from different parts of the State bespeak a great and constantly growing interest in this subject. Thoughtful farmers and mechanics have expressed a great desire that some practical tests be made in growing trees for timber.

METEOROLOGICAL REPORT.

Immediately after the establishment of the Experiment Station, with the assistance of Prof. T. C. Mendenhall, Director of the Meteorological Bureau, necessary instruments were secured, and systematic observations of temperature, rain-fall, direction of wind, etc., have since been regularly recorded. It is hoped that the statistics now being collected from different parts of the State may be of service in studying the relation which temperature, moisture, etc., bear to the growth and yield of our most important agricultural products.

It is a well known fact that different portions of our State vary in a marked degree in the amount of rainfall. There is also a wide variation in range of temperature in different localities.

This will be better understood when we consider that evaporation is a cooling process, and the natural sequence of heavy rainfall must be lower temperature.

The matter of rainfall is of vast importance, and it is to be hoped that the careful observations which the Meteorological Bureau is making will throw some light upon this important question. For instance, last summer a strip of country lying adjacent to the Maumee river was deluged with rains during July and August, while here at the University farm from July 10th until the middle of September not an inch of rain fell; while the Government Station, but three miles distant, reported from two to three inches of rain for each month.

The table gives the maximum and minimum temperature and date, and mean temperature and rainfall for each month of 1882, and the mean temperature and rainfall of each month for the years 1879, 1880 and 1881. This affords a comparison of four years.

By comparing the total rainfall of the four years we see a steady increase, from 31.26 inches in 1879 to 51.30 inches in 1882, and with this increase of moisture the corn crop falls from 111,877,124 bushels in 1879 to 93,319,200 bushels in 1882—a decrease of 18,567,924 bushels, or nearly one million bushels for each inch that the rainfall increased. The average rainfall for Ohio is about 40 inches, thus in 1879 the total precipitation was about 9 inches below the average, while in 1882 it was over 11 inches above. The rainfall for the nine months, ending June 30, 1882, was 55.13 inches, or 15.13 inches greater than the average year, the greatest precipitation being in May, which shows 9.59 inches of rainfall, the greatest of any month for the four years.

This excessive moisture accounts for the late frosts of last spring, continuing in this latitude up to May 3d. We have no means of estimating the immense damage of these late frosts to small fruit-growers and gardeners.

A very important question, which we have not the data at hand to settle is, "does not the seasons of drouth almost universally occur during years of excessive rainfall?" We hope that future observations will enable us to give an intelligent answer.

In the table will also be found the maximum and minimum temperature for each year with date of occurrence. The lowest temperature for the four years being 20° below zero, January 3, 1878, and the highest, 103°, July 10, 1881.

TABLE GIVING SUMMARY OF METEORLOGICAL OBSERVATIONS IN REGARD TO TEMPERATURE AND RAINFALL FOR THE YEARS 1879, 1880, 1881, AND 1882.

	Maximum temperature.		Minimum temperature.		Mean temperature.	Rain and melted snow.	Mean temperature and rainfall for 1881.		Mean temperature and rainfall for 1880.		Mean temperature and rainfall for 1879.	
	Date.	Degrees.	Date.	Degrees.	Degrees.	Inches.	Degrees.	Inches.	Degrees.	Inches.	Degrees.	Inches.
January	26th.	59	24th.	11	32.4	4.69	24.4	2.25	43.8	4.49	25.4	1.66
February	28th.	68	1st.	20	41.2	5.94	29.2	4.44	38.5	1.70	29.0	1.43
March	2d.	69	25th.	25	44.2	4.76	36.7	4.01	40.5	2.42	41.3	3.77
April	4th.	81	.11th.	23	50.3	4.87	46.8	2.04	53.7	5.06	50.5	0.92
May	20 and 27	77	1 and 3	33	57.0	9.59	67.5	2.00	68.7	3.21	65.1	2.09
June	25th.	91	2, 4, and 5	48	68.9	6.01	69.9	4.02	72.8	3.30	71.7	2.68
July	27th.	88	5th.	54	70.7	2.62	78.1	5.33	74.9	4.86	79.1	3.67
August	6th.	89	11th.	52	71.1	3.14	75.2	2.09	74.0	6.95	71.6	4.64
September	18th.	87	25th.	47	65.0	2.91	73.7	1.54	64.8	1.80	61.5	2.33
October	8th.	80	25th.	36	58.1	2.44	59.7	3.64	51.6	2.35	61.9	0.26
November	11th.	72	30th.	22	42.0	2.05	43.6	5.35	33.4	4.54	43.9	3.52
December	21st.	51	8th.	4	31.4	2.28	39.7	5.28	24.9	3.98	37.0	4.29
Mean temperature and rainfall for the year					52.7	51.30	50.7	46.99	53.8	44.68	53.2	31.26
				Date.			Date.		Date.		Date.	
Maximum temperature for each year				June 25	91.0		July 10	103	July 13	97	July 15	96
Minimum temperature for each year				Dec. 8	4		Jan. 12	3	Dec. 30	12	Jan. 3	20

FERTILIZER CONTROL.

"An Act to prevent fraud in the manufacture and sale of Commercial Fertilizers."

REVISED STATUTES, CHAPTER 21 – FERTILIZERS.

SECTION 4446 *a*. Any person or company who shall offer, sell, or expose for sale, in this State, any commercial fertilizer, the price of which exceeds ten dollars a ton, shall affix to every package, in a conspicuous place on the outside thereof, a plainly printed certificate, stating the number of net pounds in the package sold or offered for sale, the name or trade-mark under which the article is sold, the name of the manufacturer, and the place of manufacture, and a chemical analysis stating the percentage of nitrogen, or its equivlent in ammonia, in an available form, of potash soluble in water, and of phosphoric acid in available form (soluble or reverted), as well as the total phosphoric acid.

SEC. 4446 *b*. Before any commercial fertilizer is sold or offered for sale, the manufacturer, importer, or party who causes it to be sold or offered for sale within the State of Ohio, shall file with the Secretary of the Ohio State Board of Agriculture, a certified copy of the certificate referred to in section one [4446*a*] of this act, and shall deposit with said Secretary a sealed glass jar, containing not less than one pound of the fertilizer, accompanied with an affidavit that it is a fair average sample.

SEC. 4446 *c*. The manufacturer, importer, or agent of any commercial fertilizer exceeding ten dollars per ton in price, shall pay annually, on or before the first of May, a license fee of twenty dollars for the privilege of selling or offering for sale within the State, said fee to be paid to the Secretary of the Ohio State Board of Agriculture: Provided, that whenever the manufacturer or importer shall have paid the license fee herein required for any persons acting as [*agents for*] such manufacturer or importer, such agents shall not be required to pay the fee named in this section.

SEC. 4446 *d*. All analyses of commercial fertilizers sold within the State, shall be made by or under the direction of the Secretary of the Ohio State Board of Agriculture, and paid for out of funds arising from license fees, as provided for in section three [4446 *c*]. At least one analysis of each fertilizer sold shall be annually made.

SEC. 4446 *e*. Said Secretary shall publish annually, a correct report of all analyses made and certificates filed, together with a statement of moneys received on account of license fees and expended for analyses; and any surplus arising from license permits shall be placed to the credit of the agricultural fund.

SEC. 4446 *f*. Any person or party who shall offer or expose for sale any commercial fertilizer without complying with the provisions of sections one, two, and three [4446 *a*, *b*, *and c*,] of this act, or shall permit an analysis to be attached to any package of such fertilizer, stating that it contains a larger percentage of any one or more of the constituents named in section one [4446 *a*] of this act, than y does contain, shall be fined not less than two hundred dollars for the first offense, and not less than five hundred dollars for every subsequent offense, and the offender, in all cases, shall also be liable for damages sustained by the purchasers of such fertilizers; provided, however, that a deficiency of one per cent. of the nitrogen, potash or phosphoric acid claimed to be contained, shall not be considered as evidence of fraudulent intent.

SEC. 4446 *g*. Suit may be brought for the recovery of fines or damages, under the provisions of this act, in the county where the fertilizer was offered for sale, or where it was manufactured; and all fines so recovered, shall be paid into the treasury of the State by the court collecting the same.

SEC. 4446 *h*. The Secretary of the Ohio State Board of Agriculture, or any person by him deputized, is hereby empowered to select from any package of commercial fertilizer exposed for sale in any county in Ohio, a quantity not exceeding two pounds, which quantity shall be for analysis to compare with sample deposited with said Secretary, as provided in section two [4446 *b*] of this act, and with the printed certificate found on the given package found on sale.

SEC. 4446 *i*. All suits for the recovery of fines under the provisions of this act, shall be brought by the Secretary of the Ohio State Board of Agriculture, in the name of the State of Ohio.

SEC. 2. This act shall take effect and be in force from and after the first day of May, 1881.

TABULATED ANALYSES AND VALUATIONS OF FERTILIZERS, INCLUDING ALL MADE UP TO DECEMBER 12, 1882.

ISSUED BY THE OHIO STATE BOARD OF AGRICULTURE, DECEMBER 20, 1882.

The analyses are by Prof. N. W. Lord, Ohio State University, Columbus, Chemist of the Board of Agriculture. The samples were selected by the Secretary of the Board, at the times and places given in the tables, in accordance with the act of March 16, 1881.‡ All samples given are verified by oath on file in this office. The valuations are by the Secretary, and are based on the average commercial value of the ingredients in Ohio, viz., ammonia, 18 cents per pound; soluble phosphoric acid, 12 cents; "reverted," 10 cents; and potash, 6 cents. Insoluble phosphoric acid in "fine" ‖ bone, 7 cents; in "medium," 6 cents; in "course," 5 cents.

[TABLE I.—Bone and "untreated" organic matter.—See also table II.]

Record number.	Name of fertilizer.	Name and address of manufacturer.	Where and when selected.	Ingredients—Per cent.					† Estimated value per ton.	Record number.
				Nitrogen rated as ammonia.	Phosphoric acid.					
					‖ In "fine" bone.	‖ In "medium" bone.	‖ In "coarse" bone.	Total phosphoric acid.		
64	Shilling's Pure Ground Bone	Excelsior Fertilizer Co., Alliance, O.	Alliance, April 26	4.79	10.92	10.92	....	21.84	$45 64	64
66	Pure Bone Dust	J. C. Stockberger, Canton, O.	Canton, April 26	4.76	9.95	13.76	....	23.70	47 58	66
67	Bone Phosphate	" "	" "	7.73	5.73	7.48	2.71	15.92	47 54	67
68	Premium Ground Bone	Excelsior Fertilizer Co., Salem, O.	Salem, April 27	4.84	9.17	11.66	....	20.83	44 24	68
71	Pure Fine Ground Bone	Thompson & Edwards, Chicago, Ill.	" "	1.53	15.81	3.74	1.25	20.80	33 38	71
72	Pure Raw Bone Meal	Geo. E. Currie & Co., Cincinnati, O.	" "	4.27	11.98	7.19	2.61	21.78	43 37	72
77	Pure Banner Bone Flour	Michigan Carbon Works, Detroit, Mich.	Alliance, "	3.57	16.10	....	....	16.10	35 39	77
82	Pure Bone Dust	Newburgh Fertilizer Co., Newburgh, O.	Newburgh, April 28	4.93	10.43	8.77	4.50	23.70	47 36	82
83	Champion Fertilizer	" "	" "	10.37	3.35	2.89	1.56	7.80	47 05	83
84	Pure Bone	Hill, Thompson & Co., Cleveland, O.	Cleveland, "	4.84	6.09	13.50	2.18	21.78	44 33	84
85	Pure Raw Bone	" "	" "	4.25	6.70	8.49	7.16	22.35	42 03	85
88	Pure Ground Bone	S. H. Morgan & Co., Toledo, O.	" "	5.61	4.39	5.25	12.27	21.91	45 02	88
89	Packing House Fertilizer	Cleveland Provision Co.	" "	6.54	13.23	2.81	0.50	16.54	45 93	89
100	Ammoniated Bone Flour	Geo. E. Currie & Co., Cincinnati, O.	Cincinnati, May 9	2.80	23.83	4.22	2.11	30.16	51 61	100
102	Ammoniated Ground Bone	Central Chem. and Manuf'g Co., Cincinnati, O.	" "	2.55	17.58	4.07	3.51	25.11	42 12	102
105	Ammoniated Bone Meal	Amor Smith & Co., Cincinnati, O.	" "	3.48	13.67	7.50	0.88	22.05	41 55	105
106	Pure Ground Bone	McCallum & Poto, Dayton, O. and Limaville, O.	Dayton, May 25	4.59	11.53	10.00	0.22	21.75	44 88	106
108	Pure Animal Bone	Lister Bros., Cleveland, O. and Newark, N. J.	Cleveland, June 8	2.93	6.26	2.51	3.76	12.53	26 08	108
110	Pure Banner Bone Flour	Michigan Carbon Works, Detroit, Mich.	" " 16	3.40	17.61	....	....	17.61	36 89	110
112	Schilling's Pure Ground Bone	Excelsior Fertilizer Co., Alliance, O.	Alliance, June 16	4.97	9.82	18.01	....	22.88	47 25	112

115	**Premium Ground Bone**	**Excelsior Fertilizer Co., Salem, O.**	**Salem, June 17**	4.46	18.18	8.43	....	21.61	44 64	115
116	" "	" "	" "	4.88	9.05	12.49	....	21.54	45 28	116
117	**Pure Raw Bone**	**Hill, Thompson & Co., Cleveland, O.**	Cleveland, June 17	4.68	13.34	9.37	0.70	23.41	47 29	117
119	Pure Bone Meal	C. Abendscham, Marietta, O.	Marietta, June 30	4.67	9.56	9.35	2.82	21.73	44 28	119
122	Pure Bone Dust	J. W. Spangenberg & Co., Warren, O	Warren, July 6	1.70	26.65	5.07	....	31.72	49 51	122
123	Pure Ground Bone	L. L. Crocker, Buffalo, N. Y.	Cleveland, July 6	4.80	10.34	6.25	7.46	24.05	46 72	123
124	Superior Bone Meal	Cleveland Dryer Co., Cleveland, O.	" "	4.12	22.38	....	....	22.38	46 16	124
125	Fine Raw Bone	North-western Fertilizer Co., Chicago, Ill	" "	4.48	14.75	7.85	1.19	23.79	47 39	125
126	**Homestead Raw Bone with Potash**	Michigan Carbon Works, Detroit, Mich.	Berea, June 7	2.80	14.90	....	*2.42	14.90	33 84	126
139	**Pure Fine Raw Ground Bone**	W. D. McLaughlin, Steubenville, O.	Steubenville, Aug. 23	4.03	12.73	10.42	....	23.15	44 82	139
143	**Akron Ground Bone**	L. Kryder & Son, Akron, O.	Akron, October 27	4.54	13.29	7.06	0.41	20.76	43 88	143

‖ NOTE 1.—"Fine" bone is that portion that will pass through a sieve with meshes 1-25 inch apart; "medium," 1-12 inch; "coarse" includes all coarser than 1-12 inch.

† NOTE 2.—The *selling price* is not given, as it varies so largely in different localities.

NOTE 3.—Potash and ammonia were determined only when claimed by the manufacturer. Special determinations were made for nitric acid whenever it was claimed. All forms of nitrogen are given in equivalents of ammonia.

‡ NOTE 4.—Nos. 114, 127, 141 and 146 are the only exceptions. As the goods could not be found in market in time, samples furnished by the manufacturers, or by an agent of the Secretary, were analyzed. Duplicate samples from open market will be given in the next report, if possible, as also of all other brands that have complied with the law.

NOTE 5.—Nos. 81, 90½, 101, 109, 110, 111, 112, (115 and 116), 117, 120, 136 and 147 are duplicates respectively of
Nos. 78, 90, 87, 76, 77, 74, 64, 68, 84, 80, 127 and 76. The Law requires that "at least one analyses of each fertilizer sold shall be annually made" by the State Board of Agriculture.

* Potash.

TABULATED ANALYSES AND VALUATIONS OF FERTILIZERS—Continued.

[TABLE II.—Superphosphates and fertilizers "acidulated" or "treated" with sulphuric acid.—See also table I for valuations of ingredients.]

Record number.	Name of Fertilizer.	Name and Address of Manufacturer.	Where and when selected.	Ingredients—Per cent.						Estimated value per ton.	Record number.
					Phosphoric acid.						
				Nitrogen rated as ammonia.	Soluble.	Reverted.	Insoluble.	Total.	Soluble potash.		
65	Bone and Blood Superphosphate	Excelsior Fertilizer Works, Alliance, O.	Alliance, April 26	3.82	2.15	3.90	2.57	8.62	0.37	$29 72	65
69	Dissolved Bone Meal	Thompson & Edwards, Chicago, Ill	Salem, April 27	1.10	0.72	3.40	11.90	16.02	....	24 39	69
70	Ammoniated Bone Superphosphate	" " "	" "	2.21	7.30	3.00	3.38	13.68	....	34 86	70
73	"T. and P." Acid Superphosphate	Waring Fertilizer Co., Colora, Md	" "	0.34	8.86	2.69	4.35	15.90	....	32 19	73
74	Ammoniated Bone Superphosphate	L. L. Crocker, Buffalo, N. Y	" "	2.68	5.48	2.79	2.40	10.76	1.26	32 20	74
75	Standard Superphosphate	Lister Bros., Cleveland, Ohio, and Newark, New Jersey	Alliance, April 27	2.06	8.34	1.95	3.05	13.34	0.98	35 56	75
76	Homestead Superphosphate	Michigan Carbon Works, Detroit, Mich.	" "	3.33	6.44	1.47	0.59	8.50	0.93	32 07	76
78	Forest City Superphosphate	Cleveland Dryer Co., Cleveland, O	" "	3.05	6.56	1.59	1.69	9.84	....	31 59	78
79	Square Bone	" " "	Newburgh, April 28	3.40	1.08	5.56	8.50	15.14	....	34 45	79
80	Buckeye Superphosphate	" " "	" "	2.60	6.98	1.44	0.84	9.26	....	29 83	80
81	Forest City Superphosphate	" " "	" "	3.89	10.86	0.91	0.37	12.14	....	42 28	81
86	"National" Dissolved Phosphate	U. S. Chemical Co., Philadelphia, Pa.	Cleveland, April 28	....	8.66	3.29	4.69	16.64	....	32 05	86
87	Raw Bone Superphosphate of Lime	Geo. E. Currie & Co., Cincinnati, O.	" "	4.16	2.32	5.02	8.50	15.84	....	39 09	87
90	U. S. Superphosphate	Lister Bros., Cleveland, O., and Newark, New Jersey	" "	1.70	5.20	0.85	1.29	7.34	5.77	28 56	90
90½	U. S. Superphosphate	Lister Bros., Cleveland, O., and Newark, New Jersey	" May 5	2.29	5.92	1.49	0.58	7.99	3.33	30 21	90½
91	Ammoniated Dissolved Bone	Lister Bros., Cleveland, O., and Newark, New Jersey	" "	3.15	8.08	1.96	0.96	11.	2.61	38 73	91

92	Bowker's Hill and Drill Superphosphate	Bowker Fertilizer Co., Boston, Mass., and New York City	Wellington, May 4	3.23	6.64	1.06	2.97	10.67	2.29	35 41	92
93	Bowker's Dissolved Animal Bone	Bowker Fertilizer Co., Boston, Mass., and New York City	" "	2.80	6.74	0.80	3.39	10.93	1.41	33 94	93
94	Bowker's Dissolved Bone	Bowker Fertilizer Co., Boston, Mass., and New York City	" "	2.21	5.87	0.74	3.23	9.84	2.02	29 18	94
95	Bowker's Acid Phosphate of Lime	Bowker Fertilizer Co., Boston, Mass., and New York City	Painesville, "	....	9.15	1.19	5.83	16.17	....	30 17	95
96	Garden City Superphosphate	North-western Fert. Co., Chicago, Ill.	Cleveland, May 5	2.63	7.18	0.65	1.31	9.14	1.32	30 89	96
97	Excelsior Superphosphate	Lake Erie Dryer Co., Cleveland, O.	Cleveland, May 5	3.65	2.42	1.88	2.22	6.52	0.19	25 16	97
98	Homestead Tobacco Grower	Michigan Carbon Works, Detroit, Mich.	" "	3.71	9.60	0.11	0.19	9.90	2.32	39 59	98
99	Sea Fowl Guano	Bradley Fertilizer Co., Boston, Mass	....	2.72	7.54	1.51	1.54	10.59	1.76	34 56	99
101	Curie's Raw Bone Superphosphate of Lime	Geo. E. Currie & Co., Cincinnati, O.	Cincinnati, May 19	3.74	1.80	7.47	9.77	19.04	....	42 49	101
103	Standard Superphosphate	Standard Fertilizer Co., Cincinnati, O.	" "	2.93	....	0.57	1.35		4.74	18 15	103
104	Ammoniated Superphosphate of Lime	Amor Smith & Co., Cincinnati, O.	" "	3.57	4.57	5.92	9.51	19.00	....	45 23	104
107	Golden Harvest Superphosphate	McCallum & Pots, Dayton, O., and Limaville, O.	Dayton, May 20	6.29	2.60	4.99	3.27	10.86	....	42 13	107
109	Homestead Superphosphate	Michigan Carbon Works, Detroit, Mich.	Cleveland, June 16	1.95	5.78	1.05	0.72	7.55	1.98	26 09	109
111	Ammoniated Bone Superphosphate	L. L. Crocker, Buffalo, N. Y.	Twinsburgh, June 16	2.46	5.56	1.05	4.52	11.18	1.08	30 11	111
113	"Americus" Superphosphate	Williams, Clark & Co., New York City	Salem, June 17	2.76	7.26	0.65	3.23	11.41	....	31 88	113
114	"Universal" Superphosphate	" " "	From sample in agent's office	1.87	6.98	1.13	2.89	11.	2.57	31 71	114
118	"Roanoke" Superphosphate	Etiwan Phosphate Co., Charleston, S. C.	Higginsport, June 28	2.01	4.31	1.69	2.51	8.51	1.23	24 95	118
120	Buckeye Superphosphate	Cleveland Dryer Co., Cleveland, O.	Athens, July 1	2.73	6.35	0.85	4.02	11.04	....	30 80	120
121	National Bone Dust	North-western Fert. Co., Chicago, Ill.	" "	2.84	5.56	0.93	4.00	10.49	....	29 42	121
127	Diamond Soluble Bone	Walton, Whann & Co., Wilmington, Del.	Samplesent by manufacturers with affidavit	....	9.45	1.16	3.39	14.00	....	28 39	127
134	"A No. 1" Superphosphate	Lake Erie Dryer Co., Cleveland, O.	Cleveland, August 2	4.25	4.00	0.78	0.43	5.21	0.27	27 21	134
135	Ammoniated Dissolved Bone	Northwestern Fertilizer Co., Chicago, Ill.	Samp. by F. J. Cutter, Marietta, August 9	1.99	6.30	0.69	4.32	11.31	1.06	29 25	135
136	Diamond Soluble Bone	Walton, Whann & Co., Wilmington, Del.	Cleveland, August 23	....	9.54	1.71	3.42	14.67	....	29 74	136
137	Dissolved Bone Meal	Thompson & Edwards, Chicago, Ill.	Ravenna, "	0.76	1.70	3.34	8.17	13.21	....	21 67	137
138	Double Eagle Phosphate	Baugh & Sons, Phila. and Baltimore	Edinburgh, "	1.19	4.76	1.27	5.96	11.99	....	24 20	138
140	Champion Superphosphate	E. Rauh & Sons, Dayton, O., and Indianapolis, Ind.	Dayton, August 26	1.61	1.12	4.00	6.87	11.99	2.60	26 46	140
141	Ammoniated Superph'phate	L. Frank & Sons, Zanesville, O.	Samplesent by manufacturers with affidavits	1.61	3.64	1.06	3.43	8.13	2.61	23 21	141
142	Alkaline Bone	Farmers' Fertilizer Co., Syracuse, N. Y.	Cuyah'ga Flls, Nov. 24	0.17	4.64	4.13	3.53	12.30	2.15	22 64	142
144	Ammoniated Dissolved Bone	Bradley Fertilizer Co., Boston, Mass	Akron, October 27	3.14	7.64	1.60	1.33	10.57	2.50	37 17	144
145	Alkaline Bone	" "	" "	0.17	8.29	1.59	0.16	10.04	1.30	25 41	145
146	Standard Fertilizer (new formula)	Standard Fertilizer Co., Cincinnati, O.	Sample sent by manufacturers	2.99	....	0.78	2.00	2.78	6.44	22 05	146
147	Homestead Superphosphate	Michigan Carbon Works	Hudson & Orrville, November 23	2.04	9.00	11.10	0.70	11.10	0.90	33 52	147

TABULATED ANALYSES AND VALUATIONS OF FERTILIZRES, ETC.—Continued.

Record number.	Name of Fertilizer.	Name and Address of Manufacturer.	Where and when selected.	Ingredients—Per cent.						Estimated value per ton.	Record number.
					Phosphoric acid.						
				Nitrogen rated as ammonia.	Soluble.	Reverted.	Insoluble.	Total.	Soluble potash.		
	The following brands have complied with the law up to Sept. 9. They will be sampled and analyzed as soon as possible:										
128	Alkaline Bone Superphosphate	Maryland Fertilizer and Manufacturing Co., Baltimore, Md.		*	* 11.	*	*	* 14.	* 3.5		128
129	National Dissolved Superphosphate with 3 per cent. Potash	U. S. Chemical Co., Philadelphia			12.½				3.		129
130	The Yeasley Dissolved Phosphate	U. S. Chemical Co., Camden, N. J.			12. to 15.						130
131	Zell's Economizer	P. Zell & Sons, Baltimore, Md		1. to 2.	5. to 10.		5. to 10.	10. to 20.	5.-10.		131
132	Calvert Guano	" "		0.5 to 1.	5. to 10.		5. to 10.	10. to 12.	5.-10.		132
133	Dissolved Bone Phosphate	" "			5. to 10.		5. to 10.	10. to 12.	5.-10.		133
148	Soluble Pacific Guano	Sol. Pacific Guano Co., H. Dunlap, Agt., Berea, O.		2.5 to 3.5	8. to 9.			9. to 14.	3.		148
149	Popplion Sillicated Phosphate	Popplion Sillicated Phosphate Co., Baltimore, Md.		2.	10. to 12.			11. to 13.	2½.-3.		149
150	Sea Island Guano	Rasin Fertilizer Co., Baltimore, Md		2 to 3.50	8. to 11.		2. to 5.		1.-3.		150

* Claimed,

WORK IN PROGRESS.

EXPERIMENTS IN WHEAT.

These experiments are being conducted in a large field situated south of the State University campus. The soil of this field is somewhat variable. That portion devoted to wheat experiments is the most nearly uniform. It is a clayey loam. The natural drainage is excellent, the soil resting upon a bed of coarse gravel. It is not tile-drained. The main plots are of two sizes, viz., one-thirty-second and one-sixteenth of an acre. The size of the small plots is four feet square. In these are planted over one hundred different varieties. Here also are tests in planting select heads, planting at different distances, different depths, etc. The object of these tests is comparison, selection, and an opportunity for studying the growth and development of the wheat plants. They have also been planted with reference to cross-fertilization.

Test of Varieties.—This comes next to the small beds, and consists of twenty plots, as shown in the plan. These are one-sixteenth of an acre in size. They are mainly devoted to well established standard varieties.

Thick and Thin Seeding.—This test is confined to eight plots. The quantity of seed sown per acre increases at the rate of one peck per plot and from two to nine pecks per acre.

Methods of Cultivation.—This test consists of eight plots, to be devoted to special treatment in the spring. One of the plots has been protected by a covering of straw.

Early and Late Plowing and Sowing.—Under this head an attempt has been made to combine two tests, viz., early and late sowing upon land that has all been plowed early, and early and late sowing upon land plowed early and late. The first sowing was August 25. One plot was sown each succeeding week until October 13.

Application of Fertilizers.—These tests include a large number of plots. Reference to the plan will fully explain the work begun.

Methods of Seeding and Culture.—These tests embrace the ridge drill, common drill, and broadcast methods of seeding. The well-known Lois Weeden system of culture is to be given a thorough trial. The last two plots are regarded as one of a series of a regular rotation of crops.

PLAN OF WHEAT EXPERIMENTS.

	Stable manure, 16 T. per A	268		267	Sowed for rotation	Sowed October 5th.
METHOD OF CULTURE	Ordinary for comparison	266		265	Sown ordinary, to compare with Lois Weeden	Sowed October 4th.
	Lois Weeden culture	264		263	Lois Weeden culture	
	Common drill, 5 pk. per A	262		261	Common drill, 6 pk. per A	
	Broad cast, 5 pk. per A	260		259	Ridge drill, 6 pk. per A	
	Ridge drill, 5 pk. per A	258		257	Ridge drill, 4 pk. per A	
	Ridge drill, 3 pk. per A	256		255	Ridge drill, 2 pk. per A	
FERTILIZERS	Nothing	254		253	Salt, 5 bu. per A	Sowed Sept. 28th.
	Wood ashes, 75 bu. per A	252		251	Plaster, 600 lbs. per A	
	Lime, 50 bu. per A	250		249	Nothing	
	Special wheat manure, 900 lbs	248		247	Special wheat manure, 800 pounds	
	Mixture { Nitrate of soda 75 lbs. Phosphate 100 lbs. Potash 38 lbs. }	246	Road.	245	Mixture { Nitrate of soda, 150 lbs. Phosphate, 200 lbs. Potash, 75 lbs. }	
	Stable manure, 13 T. per A	244		243	Nothing	
	Mixture { Nitrate of soda 300 lbs. Phosphate 400 lbs. Potash 150 lbs. }	242		241	Mixture { Phosphate, 400 lbs. Potash, 150 lbs. }	
	Mixture { Nitrate of soda 300 lbs. Potash 150 lbs. }	240		239	Mixture { Nitrate of soda, 300 lbs. Phosphate, 400 lbs. }	
	Nothing	238		237	Muriate of potash, 150 lbs	
	Phosphate, 400 lbs	236		235	Nitrate of soda, 300 lbs	
	Special wheat manure, 700 lbs	234		233	Special wheat manure, 600 lbs	
	Nothing	232		231	Special wheat manure, 500 lbs	
	Special wheat manure, 400 lbs	230		229	Nothing	
	Special wheat manure, 300 lbs	228		227	Special wheat manure, 200 lbs	

PLAN OF WHEAT EXPERIMENTS—Continued.

EARLY AND LATE PLOWING AND SOWING.	Sowed October 13th. Plowed October 12th	226	Road.	225	Sowed October 6th	Plowed October 6th.
	Sowed Sept. 29th. Plowed Sept. 28th	224		223	Sowed September 22d	Plowed Sept. 22nd.
	Sowed Sept. 22d. Plowed Sept. 11th	222		221	Sowed September 22d	Plowed Sept. 8th.
	Sowed Sept. 15th. Plowed Sept. 14th	220		219	Sowed September 8th	Plowed Sept. 8th.
	Sowed Sept. 22d. Plowed Aug. 31st	218		217	Sowed September 22d	Plowed August 23d.
	Sowed Sept. 1st. Plowed Aug. 31st	216		215	Sowed August 25th	Plowed August 23d.
METHODS OF CULTIVATION.	Mulched with straw	212		213	To be cultivated	Sowed Sept. 28th.
	Spring work with fertilizers	214		211	To be cultivated	
	To be hand-hoed	210		209	To be harrowed	
	Left ordinary	208		207	To be left ordinary	
THICK AND THIN SEEDING.	9 pk. per acre. Sowed Sept. 23d	206		205	8 pk. per acre	Sowed Sept. 23d.
	7 pk. per acre. Sowed Sept. 23d	204		203	6 pk. per acre	
	5 pk. per acre. Sowed Sept. 23d	202		201	4 pk. per acre	
	3 pk. per acre. Sowed Sept. 23d	200		199	2 pk. per acre	

PLAN OF WHEAT EXPERIMENTS—Continued.

VARIETIES	Russian May, sowed Sept. 22nd	198	Road.	197	Travis	Sowed
	Golden Straw, sowed Sept. 22nd	196		195	Silver Chaff	
	Mediterranean, sowed Sept. 22d	194		193	Lancaster	
	Sandomirka, sowed Sept. 22nd	192		191	Fultz	
	Rice, sowed Sept. 21st	190		189	Zimmerman	Sowed Sept.
	York White Chaff, sowed Sept. 21st	188		187	Grecian	
	Finley, sowed Sept. 21st	186		185	Champion Amber	
	German Amber, sowed Sept. 21st	184		183	Treadwell	
	Clawson, sowed Sept. 21st	182		181	Theiss	
	Egyptian, sowed Sept. 20th	180		179	Velvet Chaff	Sowed Sept. 20th.
	88 small plots sown with different varieties and for special experiments.				90 small plots sown with different varieties.	

EXPERIMENTS IN SAVING AND APPLYING STABLE MANURE.

This work was begun the latter part of December, and is yet in progress, hence only an outline can be given. Suitable stalls in the cow stables were selected and arranged in the following manner: First, to collect the urine separately, by placing a vat about fifteen inches deep and covered with perforated lids just behind the drop. This was filled with fine straw and chaff, to act as an absorbent. Care was taken to keep the lids cleaned, so that the urine should readily drain through. The vat was cleaned as often as found necessary and the contents placed in a weather-tight box. Second, to save the solid and liquid excrement together, or in other words the stalls were so arranged as not to allow the most valuable part of the manure to drain away and be lost. This was done by placing a shallow water-tight box behind the drop, and using proper absorbents to take up the liquid manure. The manure is removed each morning. Third, to save the solid excrement separately. This was easily done by taking the manure from the top of the vat first spoken of. As little straw as possible was allowed to collect on the lids of this vat, so that this manure was nearly pure solid excrement.

Still another test is for the purpose of showing the good or ill effects of mixing in different proportions manure from the horse and cow stables. This is now being collected, mixed, and a portion kept under shelter, and equal quantities exposed to the weather. The value of each sample will be determined by chemical analysis in the laboratory, and put to a practical test in the field.

It is believed that the methods of saving and managing stable manure on many farms are susceptible of improvement. In far too many instances the liquid portion is allowed first to wash out the more soluble and most valuable part of the solid excrement, and then drain away. What remains behind is then thrown out where it is washed by rains or often injured by over-heating. Treated in this way it is not strange that the effects of farm-yard manure are not what they have been proven to be under a better system of management. The object of these tests is to show, if possible, the loss that farmers suffer by carelessness in the treatment of farm-yard manures.

SEED TESTS.

BY W. S. DEVOL.

One of the principal branches of investigation pursued by the European experiment stations, has been the testing of farm and garden seeds to ascertain their purity and vitality. Some work has been done in this line by the American stations, but it has been done principally for dealers. Owing to the late ness of the season when the Ohio Station obtained a tester, only a few samples have been tested, but quite a large number are now in process of testing. The tests made have been nearly all of Indian corn, and have been nearly all for growers and planters. Several tests that are more or less valuable can be made by almost any one at his home. The easiest of these is the gravity test. This consists in putting the seeds in a glass of water and leaving them from twenty-four to thirty-six hours, if all do not sink sooner. All good seeds of most varieties will soon sink, but old dry seeds and those gathered before they are matured will float for a greater or less length of time. This test is not entirely to be relied upon, for many seeds that have had their vitality destroyed by age, by heat, or by freezing, will sink as readily as good seeds.

Another method is to place the seeds upon sand, or between sheets of blotting or other bibulous paper, upon the sand, which should be kept quite wet and in a warm place. Another test, about as good as the "gravity test," is to throw the seeds upon a hot metal plate; the good seeds will burst or pop, throwing them from the plate, while the poor ones will remain and become charred. Seeds can also be tested before the planting season by sprouting them in a hot-bed, or a box of light loam placed in a warm window. Observing persons can determine pretty accurately the quality of seeds by their appearance and feeling. There are a number of apparatus now used for seed testing, but all built upon the principle that a constant temperature, the proper amount of moisture, and good ventilation are the essential points. Several are now in use at this Station. The one that gives the best satisfaction consists of a hemispherical copper boiler a foot in diameter, fastened to the bottom of a galvanized iron pan two feet wide, four feet long, and five inches deep. The water passes from the copper boiler into the pan through four small holes, and is made to circulate over every part of it by guides, like those in an evaporating pan. These guides are three-fourths of an inch high, and another bottom that is firmly soldered around the edges, rest on top of them; through this bottom a tube passes for filling the boiler and under-pan with water. After coming from the copper boiler the water runs back and forth several times in the lower pan, and is then conducted by a return tube back to the copper boiler, entering near the bottom. The sand, loam, and other material in which the seeds are sprouted, is placed in the upper part of the pan. A wood box about four feet high, having a hinged glazed top, is made to hold the pan, which rests upon supports about a foot from the top. In the sides of the box above the pan are openings for ventilation, which is regulated by sliding doors. Heat is produced by a small single-burner oil-stove placed under the boiler. There is a door in one side of the box to get to the stove to fill it and regulate the heat. The plan of this tester was furnished by Mr. Tracy of Detroit, who has one, but uses gasoline for heating instead of the oil-stove.

Thornburn and Titus, New York, sell a very convenient tester in three sizes, the smallest being large enough for individual testing; we have one of them in use at this Station.

A very cheap tester, also in use at this Station, consists of a pan for water with a flange near the top, upon which rests another pan filled with wet sand. The seeds are placed on loam in shallow porous saucers and sunk in the wet sand. The temperature is kept up in this by means of an ordinary coal-oil lamp.

Besides their vitality something should be known of the purity of seeds. Impurities consist of sand, dirt, chaff, and seeds of other plants, termed "foreign" seeds; these are separated from the sample and the per cent. found by weighing. With the aid of the microscope and by comparing with specimens correctly labelled, all foreign seeds are identified. There is at this Station a collection of two hundred and fifty varieties of grain, grass and weed seeds, and others are constantly being added.

In the following table the germinating power of the samples is given. The percentage that will germinate under these conditions can not be expected to grow under all circumstances in the regular farm planting. But probably the best conditions occasionally procured out of doors can not be surpassed by artificial means. In the following tests, as soon as the rootlet had burst the seed coat and extended about one-twelfth of an inch, it was counted as sprouted, and removed from the tester. In these tests it can not be determined whether the seed would produce a good healthy plant or not, but they furnish a correct idea of the quality of the seeds. Not alone upon the vitality of the seeds sown does successful planting depend, but there are other considerations, as temperature, moisture, mechanical condition of the soil, depth of planting, etc., and it is no uncommon thing for planters to charge failures produced by some of the above causes, to the quality of the seeds sown.

Number of test.	Variety.	Seed sprouted (per cent.)	Seed remained apparently sound (per cent.)	Seed rotted (per cent.)	First seed sprouted (hours).	One-half sprouted (hours).
	INDIAN CORN.					
1	Illinois White	8.	0.	92.	42	48
2	"	76.	0.	24.	42	60
3	"	28.	0.	72.	42	42
4	Leaming	90.	0.	10.	38	42
5	"	95.	0.	5.	38	42
6	"	85.	0.	15.	38	42
7	Illinois White	20.	0.	80.	38	42
8	"	40.	0.	60.	38	48
9	"	40.	12.	48.	38	42
10	Leaming	95.	0.	5.	38	96
11	"	80.	0.	20.	42	84
12	"	65.	0.	35.	42	96
13	"	88.	12.	0.	42	112
14	"	36.	0.	64.	36	72
15	Marblehead Early Sweet	100.	0.	0.	34	42
16	Leaming	60.	0.	40.	42	96
17	Evergreen Sweet	32.	4.	64.	36	40
25½	Cuzco	100.	0.	0.	48	72
26	Leaming	75.	15.	10.	40	48
27	Clark Co. Champion	30.	15.	55.	40	48
28	Leaming	20.	8.	72.	38	38
29	"	36.	28.	36.	38	40
30	Wysor's Early Shoe-peg	70.	10.	20.	40	40
48	Yellow Curtis	100.	0.	0.	24	38

Nos. 1 to 12, inclusive, were from W. Brotherton, Ohio State University Farm Manager. Nos. 1, 2, 3, 7, 8, and 9 were known to be poor before testing. No. 1 was from buts of ears, No. 2 from tips of ears, No. 3 from centres of ears; Nos. 4, 5 and 6 were taken in the same manner; Nos. 7 to 12, inclusive, were duplicates of 1 to 6 respectively.

Nos. 13 to 17, inclusive, were from J. Rolson, Columbus, Ohio. No. 13 was hung up in the fall; No. 14 was taken from the middle of the bin; No. 16 from the top of the bin.

No. 25½ was tested for the Station. It is a hybrid corn, between a kind raised by the Cuzco Indians and sweet corn. It was not fully mature when the first frosts came last fall, but the test, though of but few grains, gave splendid results; it is a little slow to germinate.

Nos. 26 and 27 were from J. A. Buel & Co, Springfield, Ohio.

Nos. 27 and 29 were from W. S. Haverfield, Cadiz, Ohio.

No. 30 was a sample distributed by the Rural New Yorker.

No. 48 was from Chas. Searle, Berkshire, Delaware county, Ohio.

Five samples of Timothy were being tested, but after four days were accidentally disturbed and the test spoiled. In the four days from 44 to 90 per cent. of the different samples had germinated.

DIRECTIONS FOR SENDING SAMPLES AND SPECIMENS.

INSTRUCTIONS FOR SAMPLING SEEDS.

Care should be exercised to have the sample a fair average of the whole amount of seed from which it was taken.

Of the smaller seeds, such as timothy, clover, garden vegetables, etc., about two ounces should be sent. Of corn, wheat, peas, etc., about six ounces.

These samples should be sent by mail, in paper or cloth sacks, or stout paper boxes; they should be securely tied but not sealed. No writing should be sent in the package. Under these conditions the postage-rate is only one cent for each ounce or fraction thereof. This must be fully prepaid, for if not the package will not be forwarded. The name of the sender should be written on the outside of each package with "from" above it.

SENDING PLANTS FOR IDENTIFICATION.

Grasses, weeds, or any other small plants may be sent by mail at the same rate as seeds. Plants for name should be sent while in blossom or in fruit. Several specimens should be collected and if possible, the whole plant, including the root, should be gathered. With larger plants send plenty of the blossoms, fruit or seed and leaves. These can be sent in boxes or securely tied in stout wrapping paper. Notes stating where, when, and under what conditions the specimens were collected, should accompany each package by letter.

DIRECTIONS FOR SENDING INSECTS.

Insects may be sent by mail. The larvæ (worms, caterpillars, etc.), should be put in a close tin or wooden box, and with them a supply of their appropriate food. No air holes are necessary. The greater the number of specimens sent the better. Perfect insects may be packed in cotton or paper and enclosed in small but stout paper boxes. A letter should be sent with each specimen, containing full notes of the habits and history of the insect as far as known, and the results of any experiments with different remedies.

AN AGRICULTURAL AND HORTICULTURAL MUSEUM.

It is the equal wish of the Station and the Agricultural Department of the State University to have a museum of agriculture and horticulture always open and accessible to the citizens of the State. I earnestly solicit from farmers, fruit-culturists, gardeners, and others, articles and materials illustrative of some branch of the above subjects. Samples of the different varieties of corn, wheat, oats, barley, and other grains; the seeds of fruit and forest trees, vegetables, and flowers, that are sound, pure, and true to name; specimens of grasses, weeds, and other small plants that may be of interest; sections of different varieties of wood; specimens of injurious or beneficial insects; samples of soil taken from different depths; all these, and many other things will be gladly received.

A museum of this character will supply a long-felt want in the State, and I trust that we shall have your active co-operation in establishing it. Due credit will be given for all donations received.

Address: WILLIAM R. LAZENBY, *Director*,
Columbus, Ohio.

TREASURER'S REPORT.

EMMETT MIX, IN ACCOUNT WITH THE OHIO AGRICULTURAL EXPERIMENT STATION.

RECEIPTS.

From State Treasurer, annual appropriation	$3,000 00

DISBURSEMENTS.

Labor	$837 27	
Equipment, implements and apparatus	604 30	
Expenses of the Board	176 65	
Freight and express charges	42 15	
Printing, postage and stationery	60 13	
Cash balance on hand	1,279 50	
		$3,000 00

MEMORANDUM.

The outstanding liabilities of the Station amount to $251.63. The estimated labor account, up to May 1, $175.00; for the distribution of the annual report, $150.00; for necessary chemical apparatus, and proper equipment of the Station rooms, $175.00. This leaves a balance of $427.87, out of which, in accordance with the provisions of the act, is to come the Director's salary.

The smallest amount annually appropriated to any Experiment Station in the United States is $5,000.00. In order to successfully carry out the work of the Ohio Agricultural Experiment Station another year this sum is required.

N. OHMER,
W. I. CHAMBELAIN,
Auditing Committee.

EMMETT MIX,
Treasurer.

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SECOND ANNUAL REPORT

OF THE

OHIO AGRICULTURAL
EXPERIMENT STATION,

FOR

1883.

PRINTED BY ORDER OF THE STATE LEGISLATURE.

COLUMBUS:
MYERS BROTHERS, STATE PRINTERS.
1884.

OHIO STATE UNIVERSITY,
COLUMBUS, O., March 1, 1884.

To Governor George Hoadly:

SIR I have the honor to submit herewith the annual report of the Ohio Agricultural Experiment Station, for the year 1883.

I trust it will meet the approval of your Excellency and the General Assembly, and prove satisfactory to the farmers, for whose benefit the Station was established.

Very respectfully,

WILLIAM R. LAZENBY,
Director.

BOARD OF CONTROL AND OFFICERS

OF THE

OHIO AGRICULTURAL EXPERIMENT STATION, 1883.

STATE BOARD OF CONTROL:

His Exc. Gov. George Hoadly	*Ex-Officio.*
William R. Lazenby	*Director.*
Nicholas Ohmer, Dayton	*President.*
W. I. Chamberlain, Columbus	*Secretary.*
Emmett Mix, Avenue	*Treasurer.*

OFFICERS:

Director:
WILLIAM R. LAZENBY.

Chemist:
N. W. LORD.

Superintendent of Field Experiments:
W. B. ALWOOD.

Botanist:
W. S. DEVOL.

Horticulturist:
W. J. GREEN.

GENERAL ANNOUNCEMENT.

The Ohio Agricultural Experiment Station was established in accordance with an act of the General Assembly, approved April 17, 1882, "for the benefit of the interests of Practical and Scientific Agriculture, and for the development of the vast agricultural resources of the State."

The experiments and investigations are carried on both in the field and laboratory, and deal with the following great agricultural interests, viz.: (1.) Grain Raising. (2. Stock Farming and Dairy Husbandry. (3.) Fruit and Vegetable Culture. (4.) Forestry.

The Station is prepared to test varieties; to analyze and test fertilizer and manures, soils, waters, milks, cattle-food, etc.; to examine seeds that are suspected of being unsound or adulterated; to identify and name weeds and other plants; to investigate and describe, when known, the habits of injurious and beneficial insects, and other work of a similar character that properly comes within its province.

It is the desire of the Board of Control to make the Station as widely useful as its limited appropriation will admit. To this end we earnestly invite the co-operation of the people and press of the State.

All communications on agricultural and horticultural topics will be fairly considered, and, as far as possible, promptly answered. Detailed reports of experiments, carefully and conscientiously made, will aid the Station in its work. Any citizen of Ohio, who is concerned in the promotion of agriculture, has the right to apply to the Station for any information it can render, and the Station will cheerfully respond to all applications, as far as lies in its power.

Samples of different varieties of corn, wheat, oats, barley, and other grains; the seeds of fruit and forest trees; vegetables and flowers, that are true to name; specimens of grasses, weeds, and other plants that may be of interest; sections of different varieties of wood; specimens of injurious and beneficial insects; these, and other articles and materials illustrative of any department of agriculture, will be gladly received.

Address all communications to

WILLIAM R. LAZENBY, Columbus, Ohio.

EXPERIMENTAL GROUNDS AND OFFICE

AT THE

OHIO STATE UNIVERSITY, NORTH HIGH STREET, COLUMBUS, O.

SECOND ANNUAL REPORT.

INTRODUCTION.

In presenting this, the Second Annual Report of the Ohio Agricultural Experiment Station, it seems desirable to repeat various statements and explanations which have appeared in the first report. This is necessary because the Station and its work are still imperfectly known to many citizens of the State.

The object of the Station and the privileges which it offers to the people of Ohio are plainly set forth in the general announcement, which is to be found on the opposite page.

The present report covers the work of the year ending March 1, 1884. Most of the experiments in wheat culture were published in a bulletin issued last September, but for the sake of those who have not had opportunity to see this, the matter is now republished, with some important additions.

SUMMARY OF YEAR'S WORK.

As during last year, field experiments with wheat and corn have been prominent features in our operations. When we consider the wide area of the State over which these cereals are successfully cultivated, and their aggregate annual value, the importance of this work is at once manifest. Our field experiments are not confined simply to comparative tests of varieties, or yields of definite areas under the influence of different methods of culture and different manures. They include a careful study of the quality and vigor of the seed; the growth of the root; the result of checking growth in one direction in order to stimulate it in another; the effects of self and cross fertilization; the best time and condition for performing the various processes of planting, manuring, cultivating, harvesting, and marketing; the treatment of insect enemies and diseases; a study of climatic conditions, etc. In short, our work includes all the important factors that influence the growth and fruitfulness of the individual plant.

Potatoes and garden vegetables, grasses and forage plants, fruits and flowers have also been subjects of carefully conducted experiments.

PRACTICAL FORESTRY.

Special attention is called to the observations and experiments made in forest tree culture. The importance of this work can scarcely be overrated, and the interest in the subject is great and constantly growing.

CHEMICAL ANALYSIS.

Over fifty (50) analyses have been made, including soils, fertilizers, milk, fruit, wheat, and a few miscellaneous products.

Fortunately, the control of commercial fertilizers is placed in the hands of the State Board of Agriculture, leaving the Station free to perform work of a more strictly experimental character. The results of such analyses made by the Station, as are of public interest, will be found in their appropriate place in this report.

SEED TESTS.

A good amount of valuable work has been done in this direction. Over four hundred (400) samples of seed from various parts of the State were examined and tested during the year. Repeated assurances have been received that these tests alone have saved to the farmers of the State more than the annual appropriation for the support of the Station.

NAMING OF PLANTS.

Many specimens of grasses, weeds, honey plants, etc.; also, varieties of grain, fruit and vegetables have been received for name and history. As far as possible, these have been identified and described. Especial pains were taken to give full information regarding the habits and distribution of and remedies for our most pernicious weeds and insect enemies. Attention is called to this portion of the report.

CORRESPONDENCE.

This has greatly increased during the past year. Letters of inquiry concerning varieties of grain, fruit, and vegetables; the use and value of commercial fertilizers; methods of cultivation; and other subjects pertaining to agricultural practice, have been received from all parts of the State.

All of these communications have been fairly considered, and, as far as possible, promptly answered. Some of these inquiries and answers being of general public interest, have been published in the Ohio Farmer. A few are reproduced in this report. Over fifteen hundred letters have been written by the Station in the course of the year.

STATION PUBLICATIONS.

It is hoped that the act establishing the Station may be so amended during the present session of the Legislature as to provide for the printing of a monthly bulletin. The Experiment Station cannot accomplish its true mission or attain its full efficiency until all those interested in its work find ready means of promptly learning just what it is doing. Efforts will also be made to use the columns of the leading agricultural journals of the State as a means of communication between the Station and those it is intended to benefit.

ACKNOWLEDGMENTS.

The Station renews its thanks to all who have aided it by wise counsel and timely suggestions. It also expresses its obligation to many friends for their generous donations of seeds, plants, implements, etc. Every contribution of this character adds something to the usefulness of the Station, and shows that its work is appreciated.

It is the earnest hope of the Board of Control and officers of the Station that this, the second annual report, may induce many farmers throughout the State to observe more closely and experiment more carefully for themselves. Its main purpose is suggestion. It embodies the experience of a single year. The results set forth should not be thoughtlessly accepted, but carefully considered, discussed, and criticised. It should be distinctly understood that the success or failure of our field tests in one particular instance can be no guide for others, unless the conditions are precisely the same. This is seldom the case, and the farmer, more than any one else, needs to "prove all things."

All that the Station hopes to accomplish by its field experiments is by repeated careful trials to gain a mass of results from which general laws of practical value may be drawn. In this spirit we present our report to the public, hoping that it will add something to the common stock of useful knowledge, and promote the agricultural interests of the State.

WILLIAM R. LAZENBY, *Director.*

IMPORTANT WORK TO BE DONE.

For the sake of convenience we have divided the great agricultural interests of the State of Ohio into four well marked departments, viz.: (1.) Grain Raising. (2.) Stock Farming and Dairy Husbandry. (3.) Fruit and Vegetable Culture. (4.) Forestry.

The first division is the most important, because corn and wheat rank first as staple products. Owing to the prominent position of these cereals in the agriculture of Ohio, a series of systematic experiments, whose object shall be to improve upon the best known methods of their cultivation, can scarcely fail to be of great practical interest to a large majority of the farmers of our State. Among the practical questions that demand and should receive the earnest attention of the Experimental Station are the following: Careful tests of the comparative value of the best varieties; test in thin and thick seeding; in sowing or planting at different dates, different distances, and different depths; in different methods of manuring and applying fertilizers; different systems of culture, etc., etc.

The following scientific work should also be done in this department: (1.) An analysis of all the fertilizers used in the field experiments. (2.) An analysis of such soils experimented upon as show marked peculiarities. (3.) Investigations of such diseases as rust, smut, blight, mildew, etc., together with the insects injurious and beneficial. (4.) The identification and description of grasses, weeds, etc. (5.) Testing the vitality of seeds and examining them for adulterations, etc. (6.) The general analysis of grains, straw, waters, and other materials and products related to "grain raising." In connection with the above experiments, careful meteorological observations and records of soil temperature should be taken daily.

STOCK FARMING AND DAIRY HUSBANDRY.

Relating to this subject the testing of clover, grasses, and various soiling crops; the effect of different times and methods of harvesting the same; the effect of different rations in fattening, and upon the yield and quality of the milk; the comparative susceptibilty of different breeds of cattle, sheep and swine to special foods and systems of feeding, etc., would give a wide field for experimental work.

Pertaining to the dairy, especially, the testing of different methods of setting milk, and separating cream; of manufacturing, curing, and preserving butter and cheese; the abortion of cows, etc., etc., offer, likewise, an interesting and instructive field for both scientific and practical experiments.

FRUIT AND VEGETABLE CULTURE.

In regard to experimental fruit culture the field is almost untrodden. We have no definite knowledge regarding the effect of special manures on the yield and quality of fruit. We know but little of the effect of different methods of propagation upon the growth, productiveness, and longevity of fruit plants and trees. The exact causes and true nature of "pear blight" and "peach yellows" are unknown. There are no practical remedies yet discovered for many of our worst insect enemies; the chemical changes that fruit undergoes in ripening; different methods of drying and preserving green fruit; the production of new varieties adapted to special systems of culture, or to special conditions of soil and location; these, and many other questions furnish a rich field for experimentation. Surely, nothing can justify a neglect or failure to do something for the encouragement and advancement of an interest of such public importance to the whole State as " fruit and vegetable culture."

FORESTRY.

The rapid and reckless destruction of our forests is compelling those who must use timber to be seriously interested in its future supply. It is also believed by many that this improvidence is beginning to seriously affect our climate. Hence, the question of forest-tree culture is one demanding our instant and most earnest attention, and offers a most fruitful field for well-directed, patient, persistent experimental work. To show how our best timber-trees can be easily, cheaply and successfully grown from seed; to determine the best varieties for special purposes; the best methods of improving and extending forests; the best time to cut, and the best way to preserve timber, etc., would be rendering a service of untold value to our State and country.

EXPERIMENTS WITH WHEAT.

These experiments have been conducted on a piece of land situated south of the Campus of the Ohio State University.

The soil is a light, clayey loam, varying from two to three feet in depth, and resting on a gravelly sub-soil. It appears to be nearly uniform throughout. It is naturally fertile, and, with good cultivation, has the capacity for yielding excellent crops.

The natural drainage is fairly good, hence no tiles have been used.

The surface soil is free from stones, and the configuration is nearly level. The land has been in cultivation for many years, but has received little manure and no extra culture.

In 1880 it was cultivated in corn. This followed by wheat, and the crop harvested this year is the third successive crop of wheat on the same land.

A portion of the land was divided into small plots, four feet square. These were used for different varieties, for testing selected heads and kernels, for planting at different distances, different depths, etc. The main plots are of two sizes, viz.: One-thirty-second and one sixteenth of an acre, exclusive of inter-space of two and one-half feet between each plot.

GENERAL PLAN.

For the sake of convenience, the wheat tests have been divided into the following general heads:

I. *Comparative test of varieties.*
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III. *Winter protection and spring cultivation.*
IV. *Early and late plowing.*
V. *Application of fertilizers.*
VI. *Preparatory culture and method of seeding.*

PLAN OF WHEAT EXPERIMENTS.

	Stable manure, 16 T. per A	268	Road.	267	Sowed for rotation	Sowed Oct. 5th.
PREPARATORY CULTURE AND METHOD OF SEEDING.	Ordinary for comparison	266		265	Sowed ordinary, to compare with Lois Weeden	Sowed Oct. 4th.
	Lois Weeden culture	264		263	Lois Weeden culture	
	Common drill, 5 pk. per A	262		261	Common drill, 6 pk. per A	
	Broad cast, 5 pk. per A	260		259	Ridge drill, 6 pk. per A	
	Ridge drill, 5 pk. per A	258		257	Ridge drill, 4 pk. per A	
	Ridge drill, 3 pk. per A	256		255	Ridge drill, 2 pk. per A	
APPLICATION OF FERTILIZERS.	Nothing	254		253	Salt, 5 bu. per A	Sowed Sept. 28th.
	Wood ashes, 75 bu. per A	252		251	Plaster, 600 lbs. per A	
	Lime, 50 bu. per A	250		249	Nothing	
	Special wheat manure, 900 lbs	248		247	Special wheat manure, 800 lbs.	
	Mixture Nitrate of soda, 75 lbs. Phosphate, 100 lbs. Potash, 150 lbs.	246		245	Mixture Nitrate of soda, 150 lbs. Phosphate, 200 lbs. Potash, 75 lbs.	
	Stable manure, 18 T. per A	244		243	Nothing	
	Mixture Nitrate of soda, 300 lbs. Phosphate, 400 lbs. Potash, 88 lbs.	242		241	Mixture Phosphate, 400 lbs. Potash, 150 lbs.	
	Mixture Nitrate of soda, 300 lbs. Potash, 150 lbs.	240		239	Mixture Nitrate of soda, 300 lbs. Phosphate, 400 lbs.	
	Nothing	238		237	Muriate of potash, 150 lbs.	
	Phosphate, 400 lbs.	236		235	Nitrate of soda, 300 lbs.	
	Special wheat manure, 700 lbs	234		233	Special wheat manure, 600 lbs	
	Nothing	232		231	Special wheat manure, 500 lbs	
	Special wheat manure, 400 lbs	230		229	Nothing	
	Special wheat manure, 300 lbs	228		227	Special wheat manure, 200 lbs	

PLAN OF WHEAT EXPERIMENTS—Continued.

EARLY AND LATE PLOWING AND SOWING.	Sowed Oct. 18th. Plowed Oct. 12th	226	Road.	225	Sowed Oct. 6th	Plowed Oct. 6th.
	Sowed Sept. 29th. Plowed Sept. 26th	224		223	Sowed September 22d	Plowed Sept. 22d.
	Sowed Sept. 22d. Plowed Sept. 14th	222		221	Sowed September 22d	Plowed Sept. 8th.
	Sowed Sept. 15th. Plowed Sept. 14th	220		219	Sowed September 8th	Plowed Sept. 8th.
	Sowed Sept. 22d. Plowed Aug. 31st	218		217	Sowed September 22d	Plowed Aug. 23d.
	Sowed Sept. 1st. Plowed Aug. 31st	216		215	Sowed August 25th	Plowed Aug. 23d.
WINTER PROTECTION AND SPRING CULTIVATION.	Mulched with straw	212		213	To be cultivated	Sowed Sept. 26th.
	Spring work with fertilizers	214		211	To be cultivated	
	To be hand-hoed	210		209	To be harrowed	
	Left ordinary	208		207	To be left ordinary	
THICK AND THIN SEEDING.	9 pk. per acre. Sowed Sept. 23d.	206		205	8 pk. per acre	Sowed Sept. 23d.
	7 pk. per acre. Sowed Sept. 23d	204		203	6 pk. per acre	
	5 pk. per acre. Sowed Sept. 23d	202		201	4 pk. per acre	
	3 pk. per acre. Sowed Sept. 23d	200		199	2 pk. per acre	

COMPARATIVE TEST OF VARIETIES.	Russian May, sowed Sept. 22d. 198	Road.	197 Travis	Sowed Sept. 22d.
	Golden Straw, sowed Sept. 22d. 196		195 Silver Chaff	
	Mediterranean, sowed Sept. 22d 194		193 Lancaster	
	Sandomirka, sowe Sept. 22d. 192		191 Fultz	
	Rice, sowed Sept. 21st 190		189 Zimmerman	Sowed Sept. 21st.
	York White Chaff, sowed Sept. 21st 188		187 Grecian	
	Finley, sowed Sept. 21st 186		185 Champion Amber	
	German Amber, sowed Sept. 21st 184		183 Treadwell	
	Clawson, sowed Sept. 21st 182		181 Theiss	
	Egyptian, sowed Sept. 20th 180		179 Velvet Chaff	Sowed Sept. 20th.
MISCELLANEOUS EXPERIMENTS.	88 small plots, sown with different varieties and for special experiments.		90 small plots, sown for different varieties.	

VARIETIES TESTED IN SMALL PLOTS.

Nearly one hundred different varieties of wheat were sown in small plots, and some of the results are exhited in table A.

In this test no attempt was made to compare varieties in regard to yield, since estimated products from such small areas are unreliable and oftentimes misleading.

The principal object in view was to compare differences in manner of growth, hardiness, quality, and length of straw, capacity for stooling, freedom from rust, time of ripening, size of heads, weight and size of grain. The hardiness of a variety is represented by the estimated percentage of winter killed.

It is extremely difficult, if not well nigh impossible, to make these estimates thoroughly reliable, yet repeated careful observations made upon such small areas gave approximately correct results.

Some varieties were received and sowed so late that no fair comparison of their hardiness could be made with varieties sown earlier. These are marked with a star (*).

A few varieties were entirely destroyed. In a few instances the percentage killed was too small to estimate.

In noting quality of straw, three terms are used, viz.: "strong," "medium," and "weak." This is thought to be sufficiently definite. No straw was marked "strong" except that which stood perfectly straight. Where more than two-thirds was lodged, it was called "weak" and "medium" ranges between the two conditions.

Length of straw is also expressed by three terms, "tall," "medium," and "short." No definite measurements in feet and inches were made.

TABLE A.

Varieties.	Time of ripening.	Length of straw.	Quality of straw.	Smooth or bearded.	Per cent. winter killed.	Size and color of grain.
Alabama	July 6	Medium	Weak	B	0	Medium Red.
American	“ 11	Tall	Strong	B	40	Large White.
Andrew, No. 4	“ 12	Medium	“	B	30	Large Red.
Australian	“ 9	Tall	Weak	B	50	Large Red.
Bennett	“ 9	Tall	“	B	0	Small Red.
Big Frame	“ 2	Short	Strong	S	10	Small Red.
Big May	“ 9	Medium	Weak	S	10	Medium Red.
Blue Stem	“ 11	“	“	S	0	Small White.
Boyer	“ 14	“	“	B	*	Large Red.
Canadian Express	“ 14	“	Strong	S	*	Large Red.
California Blue Stem	“ 9	“	Weak	B	30	Large Red.
Centennial Black Beard				B	100	Large White.
Champion Amber	“ 5	Short	Strong	S	20	Medium Red.
Clawson	“ 9	Tall	Medium	S	20	Large White.
Cornell, No. 1	“ 11	Medium	Strong	S	70	Medium White.
Cornell, No. 2	“ 11	Tall	“	S	60	Large White.
Cornell, No. 3	“ 3	Medium	Weak	S	30	Medium Red.
Cornell, No. 4	“ 9	“	“	B	40	
Duke X Mediterranean	“ 14	“	Strong	B	*	Large Red.
Dallas	“ 14	Tall	“	S	80	Medium Red.
Deihl X Egyptain	“ 10	Medium	“	S	40	Medium Red.
Early May	“ 5	“	Weak	S	0	Medium Red.
Egyptian	“ 9	Tall	Medium	B	20	Medium Red.
Emporium Scott	“ 9	Medium	Weak	S	10	Large Red.

TABLE A—Continued.

Varieties.	Time of ripening.	Length of straw.	Quality of straw.	Smooth or bearded.	Per cent. winter killed.	Size and color of grain.
Finley	July 3	Medium	Medium	S	20	Medium Red.
Fultz X Clawson	" 11	Tall	Weak	S	40	Large Red.
Fultz	" 2	Medium	"	S	30	Medium Red.
German Amber	" 9	"	Strong	S	40	Medium Red.
Golden Straw	" 5	Short	"	S	10	Medium White.
Golden Drop	" 10	Tall	Weak	S	60	Medium Red.
Gold Medal	" 11	Medium	Strong	S	30	Medium White.
Grecian	" 10	Tall	Weak	S	80	Large White.
Heighe's Prolific*	" 5	Medium	Strong	S	30	Medium Red.
Hungarian White Chaff	" 6	"	Weak	S	10	Medium Red.
Lancaster	" 9	"	"	B	40	Large Red.
Lincoln	" 10	Tall	"	S	20	Medium White.
Mammoth Red	" 9	"	"	S	40	Large Red.
Martin's Amber	" 13	"	Strong	S	*	Large White.
McGhee's Red	" 5	Medium	Weak	S	0	Large Red.
Mediterranean	" 9	"	"	B	30	Large Red.
Michigan Amber	" 11	Tall	Strong	B	40	Medium Red.
New Zealand					100	Large White.
			Strong	S		
Ostery	" 3	Short			40	Medium White.
			Weak	S		
Palestine	" 9	Tall			5	Medium Red.
Pewers	" 7	Medium	Strong	S	10	Small White.
Prossoe*					100	Medium Red.

Red Amber	“ 9	Medium	Weak	B	30	Large Red.
Red Chaff	“ 2	Short	Strong	S	40	Medium Red.
Rice	“ 9	Medium	Weak	S	20	Medium Red.
Rickenbrode	“ 11	Tall	Strong	S	10	Large White.
Rocky Mountain	“ 15	Medium	Weak	S	0	Medium Red.
Roscoe	“ 9	“	Strong	S	50	Small White.
Rogers*	“ 12	“	“	S	50	Medium Red.
Rural, No. 5	“ 16	“	“	S	*	Medium Red.
Russian, No. 2	“ 7	“	“	S	30	Medium White.
Sandomirka	“ 11	Tall	“	S	15	Small White.
Scott's Bearded	“ 9	Short	Weak	B	50	Large Red.
Scott's Smooth	“ 7	Medium	Strong	S	20	Medium Red.
Siberian	“ 16	“	Weak	S	20	Small Red.
Silver Chaff	“ 12	Tall	Strong	S	50	Large White.
Shumaker	“ 9	Short	Weak	S	30	Large Red.
Shumaker X Clawson	“ 16	Medium	Strong	S	*	Medium White.
Small Frame	“ 3	Short	Weak	S	5	Medium Red.
Smith's Improved	“ 11	Tall	“	B	50	Large White.
Sparks' Swamp	“ 5	Medium	“	B	20	Large Red.
Swamp*	“ 9	“	“	B	40	Large Red.
Surprise	“ 16	“	Strong	S	*	Medium White.
Tappahannock	“ 5	Short	“	S	40	Large White.
Theiss	“ 9	Medium	Weak	B	0	Medium Red.
Travis' Centennial	“ 13	Short	Strong	S	60	Medium Red.
Treadwell	“ 8	Medium	Weak	S. & B.	30	Medium White.
Valley	“ 11	Tall	Strong	B	50	Medium Red.
Velvet Chaff	“ 6	Medium	Medium	B	0	Medium Red.
Washington	“ 12	“	Weak	S	50	Large White.
Washington Glass	“ 11	“	Strong	S	20	Large White.
White Blue Stem	“ 9	Tall	“	B	50	Large Red.
White Eldorado	“ 11	Medium	“	S	30	Large White.
White Mountain	“ 14	“	“	S	*	Large White.
White Rose	“ 2	“	“	S	50	Medium Red.

TABLE A—Continued.

Variety.	Time of ripening.	Length of straw.	Quality of straw.	Smooth or bearded.	Per cent. winter killed.	Size and color of grain.
White Rogers	July 9	Tall	Strong	B	15	Medium White.
White Velvet	" 13	"	"	S	10	Medium White.
Winter Pearl	" 16	Medium	"	S	*	Medium Red.
Wysor's Eureka	" 13	"	"	B	*	Large Red.
Yellow Blue Stem	" 9	Tall	"	S	50	Large Red.
Yellow Missouri	" 16	Medium	Weak	S	10	Small Red.
Zimmerman*	" 6	"	Strong	S	15	Medium Red.

TABLE A—Continued.

Variety.	Average number of grains in each ear.			Weight of 50 grains in grammes.		
	Selected ears.	Average ears.	Smallest ears.	Selected ears.	Average ears.	Smallest ears.
Alabama	48	23	9	1.78	1.91	1.20
American	49	30	13	2.46	1.89	1.56
Andrews, No. 4	55	33	17	2.38	2.38	1.72
Australian	44	30	12	2.36	1.99	1.76
Bennett	48	33	15	1.55	1.72	1.34
Big Frame	49	26	10	1.85	1.72	1.55
Big May	54	29	11	1.77	1.87	1.45
Blue Stem	38	24	16	1.67	1.37	0.96
Boyer	32	27	13	2.38	2.40	1.73
Canada Express	39	22	18	2.17	1.87	1.81
California Blue Stem	44	32	10	1.96	2.06	1.68
Champion Amber	42	32	13	2.08	1.92	1.81
Clawson	46	31	16	1.99	2.00	1.45
Cornell, No. 1	44	33	17	1.68	1.69	1.48
Cornell, No. 2	42	30	15	2.16	2.14	1.40
Cornell, No. 3	36	27	16	1.91	1.83	1.58
Duke X Mediterranean	47	36	22	1.95	2.12	1.21
Dallas	56	47	19	1.81	1.58	1.25
Deihl X Egyptian	40	32	9	2.09	2.02	1.68
Early May	31	24	11	2.00	1.71	1.48
Egyptian	48	42	13	1.89	1.81	1.63
Emporium Scott	53	31	16	1.70	2.02	1.45
Finley	35	27	12	1.98	1.73	1.45
Fultz	37	22	17	2.02	1.85	1.61
Fultz X Clawson	30	24	12	2.23	2.29	1.60
German Amber	50	37	14	1.74	1.81	1.28
Golden Drop	51	29	16	1.37	1.19	1.22
Golden Straw	40	26	11	2.02	2.04	1.86
Gold Medal	49	36	18	1.92	1.81	1.00
Grecian	47	31	15	1.89	2.27	1.57
Heighe's Prolific	50	31	14	1.76	1.82	1.51
Hungarian White Chaff	43	30	10	1.86	1.88	1.30
Lancaster	35	29	11	2.17	2.08	1.67
Lincoln	43	29	16	1.74	1.89	1.55
Mammoth Red	51	36	11	1.62	2.27	1.75
Martin's Amber	55	35	11	1.99	1.66	1.27
McGhee's Red	53	28	13	1.90	2.05	1.65
Mediterranean	39	23	13	2.28	2.12	1.99
Michigan Amber	63	42	18	1.85	1.93	1.53
Ostery	34	24	9	1.87	1.86	1.57

TABLE A—Continued.

Variety.	Average number of grains in each ear.			Weight of 50 grains in grammes.		
	Selected ears.	Average ears.	Smallest ears.	Selected ears.	Average ears.	Smallest ears.
Palestine	35	25	10	2.04	2.04	1.50
Powers	47	33	15	1.71	1.65	1.43
Red Amber	45	32	14	2.33	2.14	1.54
Red Chaff	48	30	12	1.65	1.74	1.40
Ric	42	30	12	1.79	2.07	1.87
Rickenbrode	58	31	14	1.44	1.69	1.00
Rocky Mountain	55	32	16	1.70	1.97	1.65
Roger's	66	43	16	1.67	1.76	1.44
Roscoe	60	41	17	1.10	1.19	0.94
Rural, No. 5	35	22	21	1.68	1.59	1.23
Russian, No. 2	37	28	10	2.10	2.11	1.65
Sandomirka	51	31	13	1.77	1.72	1.37
Scott's Bearded	40	25	8	2.13	2.03	1.69
Scott's Smooth	31	24	10	2.35	2.02	1.47
Siberian	59	40	15	1.30	1.47	0.99
Silver Chaff	66	38	14	1.87	2.01	1.43
Shumaker	42	28	10	2.13	1.98	1.54
Shumaker X Clawson	34	31	19	2.08	1.75	1.29
Small Frame	41	26	9	1.70	1.71	1.51
Smith's Improved	47	33	14	1.90	1.74	0.79
Swamp	31	22	11	2.16	2.13	1.92
Surprise	42	40	19	1.65	1.70	1.05
Tappahannock	37	24	11	1.93	1.98	1.74
Theiss	46	32	12	1.69	1.90	1.49
Travis' Centennial	53	40	16	1.74	1.76	1.29
Treadwell, Bearded	51	33	14	1.74	1.92	1.52
Treadwell, Smooth	53	35	14	1.62	1.49	1.14
Valley	68	50	20	1.73	1.69	1.36
Velvet Chaff	40	24	8	2.00	1.91	1.71
Washington	50	34	14	1.99	1.99	1.25
Washington Glass	44	35	18	2.11	1.99	1.45
White Blue Stem	59	35	15	1.91	1.95	1.49
White Eldorado	38	31	16	2.01	2.18	1.78
White Mountain	36	32	20	2.07	1.70	1.31
White Rogers	58	31	18	1.61	1.74	1.22
White Rose	40	29	12	1.90	1.84	1.59
White Velvet	50	34	15	1.75	1.77	1.54
Winter Pearl	44	34	17	1.32	1.44	0.88
Wysor's Eureka	35	25	14	1.91	1.86	1.51
Yellow Blue Stem	32	26	12	2.08	1.90	1.45
Yellow Missouri	50	30	14	1.50	1.31	1.08

The grains from the *selected* ears of Mammoth Red and Washington Glass were badly shrunken.

In the *average* or *medium* sized ears the Dallas was the only variety badly shrunken.

In two varieties, Velvet Chaff and Red Chaff, the grains from the *small* ears were very badly shrunken.

In twenty varieties the grains from the *selected* ears were plumper, and appeared harder and of better grade than from the *medium* and small ears of the same varieties; in thirty-six varieties the grains from the *medium* ears were best; in one variety, Rice, the grains from the *small* ears appeared best; while in the rest there was but little difference in the quality of the grain. In thirty-six varieties the grains from the *selected* ears were larger than from the others; in five varieties the grains from the *medium* ears were the largest; and in the remainder there was not much difference as to size between the selected and medium ears, while in no instance were the grains from the smallest ears larger than those from the selected and medium ears.

The grains from the selected ears of eight varieties were both larger and of better quality than those from the medium and small ears; in the medium ear there were but two varieties that had grains both larger and of better quality than those from the selected and the small ears.

The grains from the selected ears of thirty-eight varieties weighed more than from the medium ears, and of seventy-six varieties more than from the small ears; from the medium ears the grains of forty varieties were heavier than from the selected ears. The grains of three varieties weigh the same from selected and medium ears. Of two varieties the grains from the small ears weighed more than those from selected ears; in no instance did they weigh more than from the medium ears.

The average weight of fifty grains from selected heads is 1.91 grammes; from medium heads, 1.86 grammes; from small heads, 1.45 grammes; average weight of fifty grains from all, 1.74 grammes.

The largest average number of grains per ear from selected heads, was sixty-eight, from Valley; from medium heads, fifty, from same variety; from small heads, twenty-two, from Duke X Mediterranean.

The smallest average number of grains per ear from selected heads, was thirty, from Fultz X Clawson; from medium heads, twenty-two, from Fultz, Swamp, and Rural, No. 5; from small heads, eight, from Scott's Bearded and Velvet Chaff.

The average number of grains per ear for all varieties: selected ears, 45.3 medium ears, 31.1; small ears, 14.3; all ears, 30.2. By comparing the last number of grains (30.2) for all ears with the average for medium ears (31.1) it will be seen that the latter represents a very fair selection of medium or average sized ears.

VARIETIES TESTED IN LARGE PLOTS.

Table B exhibits the results of field tests. Twenty varieties were experimented with in plots sufficiently large to admit of reliable estimates of yield of grain and straw per acre.

The plots contained exactly one-sixteenth of an acre.

The ground was all prepared in the same manner, and at the same time. No fertilizers, whatever, were used in this work. The soil is a clayey loam, underlaid by gravel, and naturally underdrained. No labor was spared in the preparation of the seed-bed. The ground was well plowed, thoroughly harrowed, and compacted by use of the roller.

Plots 179 and 180 were sowed September 20th, and the remaining plots September 21st and 22d. The seeding was done with a Buckeye Grain Drill.

Six pecks of seed per acre were used in each plot.

The more important points are exhibited in the table, and need no discussion.

The quality of the grain is represented by the terms, "very poor," "poor," "fair," "good," and "very good."

Finley was the first to ripen, and shows the heaviest yield of grain, and the greatest weight per measured bushel. The straw was not heavy, giving a weight of 2,400 pounds per acre less than that of the Egyptian.

The Finley has an excellent record this year, and if it continues to do well, will take first rank among our standard varieties of wheat.

The Egyptian holds second place in regard to yield of grain, and produced the heaviest straw.

Treadwell, York White Chaff, and Rice rank third in yield of grain. Sandomirkâ comes fourth. Clawson, Velvet Chaff, and Champion Amber take fifth rank.

The yields of all the above named varieties are exceptionally good for this season. In some cases, however, the straw is weak, and the grain somewhat shrunken, as is shown by the weight per measured bushel. Velvet Chaff ranks fifth in yield of grain, but ripens early, stands second in weight of measured bushel, and has fairly strong straw. The table affords many other interesting comparisons.

The wheat was harvested by hand, due care being taken to secure it in good order. As far as could be determined, each variety was cut at the same stage of ripeness.

The threshing was done with the Fearless Two-horse Tread-power Thresher, the grain being weighed, and quality noted, just as it came from the machine.

TABLE B.

Number of plot.	Name of varieties.	Time of ripening.	Yield of grain per acre.	Condition of grain.	Yield of straw per acre.	Quality of straw.	Weight of measured bushel.
179	Velvet Chaff	July 6	36.8 bushels	Good	5,845 pounds	Strong	62.5 pounds.
180	Egyptian	" 6	39.8 "	Good	6,464 "	Medium	61 "
181	Theiss	" 6	35.7 "	Very poor	6,192 "	Weak	59 "
182	Clawson	" 8	36.7 "	Good	5,904 "	Weak	58 "
183	Treadwell	" 8	38.1 "	Fair	4,608 "	Strong	59 "
184	German Amber	" 8	25.9 "	Very poor	3,024 "	Weak	58 "
185	Champion Amber	" 6	36.9 "	Good	3,200 "	Strong	56.5 "
186	*Finley*	" 5	42.8 "	Very good	4,064 "	Strong	63 "
187	Grecian	" 8	29.7 "	Fair	2,880 "	Medium	57.5 "
188	York White Chaff	" 7	38.4 "	Good	4,432 "	Strong	59 "
189	Zimmerman	" 6	33.6 "	Good	3,664 "	Medium	59.5 "
190	Rice	" 6	38.9 "	Fair	4,624 "	Weak	59 "
191	Fultz	" 6	35.1 "	Good	3,686 "	Medium	61 "
192	Sandomirka	" 8	37.1 "	Good	5,200 "	Medium	60 "
193	Lancaster	" 8	29.9 "	Poor	3,552 "	Weak	58.5 "
194	Mediterranean	" 8	34.7 "	Fair	4,448 "	Weak	58 "
195	Silver Chaff	" 9	26.8 "	Poor	2,912 "	Strong	58.5 "
196	Golden Straw	" 5	30.0 "	Good	3,056 "	Strong	60.5 "
197	Travis	" 11	27.5 "	Good	3,520 "	Medium	59 "
198	Russian May	" 6	35.8 "	Good	5,968 "	Weak	59 "

BRIEF DESCRIPTIVE NOTES OF THE VARIETIES MENTIONED IN TABLE B.

Velvet Chaff.—Made a rank growth in the fall, and passed the winter without material injury. Stood up well and ripened early. Many of the heads were short, but usually well filled. Slightly affected by rust. Though less productive than some other kinds, it maintained a good average. Yield, 36 bushels per acre. Yield of straw, 5,845 pounds per acre. Weight of the measured bushel, 62½ pounds.

Egyptian —Made a fair growth in fall. Was considerably injured by the winter, but soon rallied in spring, and covered the ground. It lodged badly a short time before ripening. Wholly free from rust. Cut at same date as Velvet Chaff. Yield, 39.8 bushels per acre. Weight of straw, 6,464 pounds per acre. Weight of measured bushel, 61 pounds.

Theiss.—Fall growth comparatively small. Stood the winter without any perceptible injury. Straw badly lodged as early as June 25th. Perfectly flat and badly tangled when cut July 6th. Considerably rusted. Heads very small, but numerous. Grain shrunken. Yield, 35.6 bushels per acre. Weight of straw, 6,192 pounds per acre. Weight of measured bushel, 59 pound.

Clawson.—Grew rank in fall. About one-fourth winter killed. Stooled out well in spring. Straw weak, being badly lodged several weeks before ripening. Cut two days later than Velvet Chaff. Heads large. Straw somewhat rusted. Yield, 36.7 bushels per acre. Weight of straw, 5,904 pounds per acre. Weight of measurel bushed, 58 pounds.

Treadwell.—Made a fair growth in fall. Winter killed badly, losing 40 per cent. of plants. For a long time in spring, growth slow and uneven. Improved rapidly as the season advanced. Stood up well. Straw free from rust. Ripe July 8, same date as the Clawson. About one-half heads bearded, one-half bald. Yield, 38.1 bushels per acre. Weight of straw, 4,608 pounds per acre. Weight of measured bushel, 59 pounds.

German Amber.—Grew well in fall, but suffered much during the winter; about 60 per cent. being killed. What remained grew well during the spring, but was thin on the ground. Straw very weak and badly rusted. Heads large, but grain shrunken. It was the least productive of the twenty varieties compared. Yield, 25.9 bushels per acre. Weight of straw, 3,924 pounds per acre. Weight of measured bushel, 58 pounds.

Champion Amber.—Made a rather poor growth in fall; not much injured by the winter, but weak and uneven in spring. Ripened July 6. Straw short and strong. Little rust. Heads rather small but compact. Ripened early. Yield, 36.8 bushels per acre. Weight of straw, 3,200 pound per acre. Weight of measured bushel, 58½ pounds.

Finley.—Grew well in fall, but winter killed to the extent of about 20 per cent. During the spring looked uneven, and weak in spots. Improved wonderfully. Ripened early. Straw stood up fairly well. Nearly free from rust. Heads medium sized. Yield, 42.8 bushels per acre. Weight of straw, 4,064 pounds per acre. Weight of measured bushel, 63 pounds.

Grecian.—Good growth in fall, but killed badly during winter; nearly one-third of the plants destroyed. Made a sickly, hesitating growth during spring. Stood up fairly well. Ripened July 8. Somewhat rusted. Yield, 29.7 bushels per acre. Weight of straw, 2,880 pounds per acre. Weigh of measured bushel, 57.5 pounds.

York White Chaff.—Made a rank growth in fall, but winter killed to the extent of from 25 to 30 per cent. Presented a weak and uneven appearance throughout the spring. Straw strong, but badly rusted. Cut July 7. Yield, 38.4 bushels per acre. Weight of straw, 4,432 pounds per acre. Weight of measured bushel, 59 pounds.

Zimmerman.—Fall growth excellent. Slightly winter killed, proving a little less hardy than Velvet Chaff. Straw moderately strong. Heads rather small, but compact and well filled. But little troubled with rust. Ripe and cut July 6. Yield, 33.6 bushels per acre. Weight of straw, 3.664 pounds per acre. Weight of measured bushel, 59.5 pounds.

Rice.—Rank growth in fall, and not much injured by winter. Straw weak and badly rusted. Heads small. Ripe July 6. Badly lodged when cut. Yield, 38.9 bushels per acre. Weight of straw, 4,624 pounds per acre. Weight of measured bushel, 59 pounds.

Fultz.—Less vigorous growth in fall than Velvet Chaff. From 15 to 20 per cent. winter killed. Straw moderately strong. Rusted quite badly. Heads rather large. Ripened early. Cut July 7. Yield, 35.1 bushels per acre. Weight of straw, 3,686 pounds per acre. Weight of measured bushel, 61 pounds.

Sandomirka.—Growth in fall rather slight. From 10 to 15 per cent. winter killed. During spring looked uneven and weak. Straw rather tall and only moderately strong. Slightly rusted. Ripe July 8. Yield, 37.1 bushels per acre. Weight of straw, 5,200 per acre. Weight of measured bushel, 60 pounds.

Lancaster.—Grew well in fall. About 20 per cent. of plants winter killed. Looked rather thin and weak during early spring. Straw weak. Very badly lodged and rusted. Ripe July 8. Heads good size. Yield, 29.9 bushels per acre. Weight of straw, 3,552 pounds per acre. Weight of measured bushel, 58.5 pounds.

Mediterranean.—Resembles the Lancaster in appearance. About 30 per cent. winter killed. Straw very weak. All down several weeks before ripe. Somewhat rusted. Ripe July 8. Yield, 34.7 bushels per acre. Weight of straw, 4,448 pounds per acre. Weight of measured bushel 59 pounds.

Silver Chaff.—Grew finely in fall. About 20 per cent. winter killed. Looked weak, thin, and sickly during spring. Straw coarse and strong. Thin on ground. Heads large but not very compact. Rusted quite badly. Ripe July 9, although the straw was quite green. Yield, 26.8 bushels per acre. Weight of straw 2,912 pounds per acre. Weight of measured bushel, 58.5 pounds.

Golden Straw.—Made a small fall growth. Fully one-half winter-killed. Showed marked stooling qualities. Straw strong and nearly free from rust. Ripe July 5. Yield, 30 bushels per acre. Weight of straw, 3,056 pounds per acre. Weight of measured bushel, 60.5 pounds.

Travis.—Good fall growth, but badly affected by winter. From 40 to 50 per cent. killed. Looked spotted and uneven throughout the spring. Straw rather weak and rusted. Several days later in ripening than any other variety. Cut July 11. Yield, 27.5 bushels per acre. Weight of straw, 3,520 pounds per acre. Weight of measured bushel, 59 pounds.

Russian May.—Grew fairly well in fall, though somewhat uneven. Not much injured by winter. Straw very weak. All down several weeks before harvest. Badly rusted. Ripe July 6. Yield, 35.3 bushels per acre. Weight of straw 5,968 pounds per acre. Weight of measured bushel 59 pounds.

THICK AND THIN SEEDING.

In tables C and D are presented the results of some experiments in "thick and thin seeding." Two series of plots were selected, as shown by general plan, pages 11, 12 and 13.

Each series contained four plots of one-sixteenth of an acre each. The treatment was alike in every respect, except in the amount of seed used. The plots were sown September 23. Velvet Chaff was the variety used. The plots were all harvested at the same date, July 6. The amount of seed used varied in the odd numbered plots from two to eight pecks per acre.

In the even numbered plots from three to nine pecks per acre. In each case the amount was increased at the rate of two pecks for each plot.

The even numbered plots, situated upon the north side of the road, had a slight advantage in location, the soil being naturally more fertile than that of the series of odd numbered plots situated upon the south side.

The four plots of each series, however, were very uniform as regards character and condition of soil.

The ripening of the wheat was quite uniform throughout. If there was any difference the earliness was in favor of the thick seeding. In regard to quality of the grain, little difference could be detected by the eye, but careful and accurate weighing showed that the thin seeding gave the largest kernels.

The quality of the straw was somewhat variable, and the difference in weight, as shown by the tables, are quite marked.

Perhaps the most striking feature in the tables is the differences in weight of measured bushels of grain from the different plots. There is an increase from 57½ to 62½ pounds.

Another observation of some interest is that the proportion of the stand winter killed was uniformly less in the case of thin, and more in the case of thick seeding.

TABLE C.

No. of plot.	Amount of seed per acre.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel of grain.
199	2 pecks.	25.9 bushels.	3296 pounds.	57.5 pounds.
201	4 "	30.2 "	3360 "	59.5 "
203	6 "	29.6 "	3168 "	61.5 "
205	8 "	25.6 "	1584 "	62.5 "

TABLE D.

No. of plot.	Amount of seed per acre.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel of grain.
200	3 pecks.	36.1 bushels.	5376 pounds.	59 pounds.
202	5 "	37.9 "	5232 "	58.5 "
204	7 "	37.3 "	5040 "	60 "
206	9 "	33.9 "	4148 "	62.5 "

The following report of experiments made at the Ohio State University by Mr. C. E. Thorne, under the direction of Prof. N. S. Townshend, is republished for the sake of comparison:

In the fall of 1877, a portion of a field of bottom land which had been put in the most thorough condition by early plowing and repeated harrowings, was divided into plots of equal size, and of as nearly as possible equal fertility, and sown at the rate of 3, 5, 6, 7, 8 and 9 pecks per acre. The result was as follows:

3 pecks seed yielded at the rate of 32¼ bushels per acre.
5 " " " 38¾ " "
6 " " " 35⅝ " "
7 " " " 37½ " "
8 " " " 37½ " "
9 " " " 31½ " "

The following season the experiment was repeated in the same field and with the same preparation of soil and seed. The number of plots was increased, however, to five for each quanity of seed; the plots being so distributed as to counter-balance, so far as possible, any irregularities of soil. The result was as follows

2½	pecks seed	yielded	27.3 to 31.3	bushels	per acre,	averaging	29.6
3	"	"	29.1 to 31.2	"	"	"	30.5
4	"	"	31.5 to 36.6	"	"	"	34.2
5½	"	"	32.8 to 37.5	"	"	"	34.9
7	"	"	33.1 to 40.3	"	"	"	35.9
9	"	"	32.5 to 35.6	"	"	"	34.2

Seven pecks of seeds, therefore, gave us four and one-half bushels additional crop in 1878, and five and one-half bushels in 1879, over what we obtained from sowing three pecks only. In both cases the seed was drilled, the variety being Clawson.

The obvious lessons to be drawn from the above tests are:

(1.) That wheat can be sown too thick as well as too thin to give the best results.

(2.) That the richer the soil and the more perfect the seed bed the less the amount of seed required.

(3.) That there is more danger of sowing too much seed on an acre than of sowing too little.

(4.) That no definite rule can be given that will serve as a reliable guide for farmers in various portions of the State in determining the best quantity per acre.

Practical Conclusion.

The condition of the soil and exposure, the quality of seed, size of individual kernels, capacity of variety for tillering, liability of injury from insects and other enemies, are all factors that should have due consideration in deciding the amount of seed to use. If all the conditions were at their best three pecks of seed per acre would be ample. This is seldom or never the case. Hence more seed is usually required.

WINTER PROTECTION AND SPRING CULTIVATION.

Under this general heading is reported the results of some tests in mulching with straw, harrowing, hoeing, and the spring application of fertilizers. The tests were confined to two series of four plots each. The size of the plot were one-thirty-second of an acre.

All of the plots were sown at the same date, and one in each series was left ordinary for purpose of comparison.

Plot 209 was harrowed with a common spike-tooth harrow, early in spring. The ground was very dry at the time, and the disturbance of the roots appeared to injure the plants.

In plot 211 two of the drill rows were destroyed, so as to leave the wheat standing in three separate strips across the plot, as follows: Commencing at one side, two rows were left, then one destroyed, then three rows were left and one destroyed, leaving two rows upon the opposite side. The spaces from which the rows had been removed were carefully hand hoed several times. On plot 213, nitrate of soda, at the rate of 300 pounds per acre was applied. The object being to see the effect of a spring application of a soluble nitrogenous fertilizer.

TABLE E.

Number of plot.	Method of treatment.	Yield of grain per acre.	Yield of straw per acre.	Quality of grain.	Weight of measured bushel.
207............	Ordinary for comparison...	37.3 bush.	3116 pounds.	Fair	58.5 pounds.
209............	Harrowed......	31.5 "	3008 "	"	57.5 "
211............	Hoed	31.6 "	3616 "	"	57.5 "
213............	Nitrate of soda 300 pounds per acre	37.6 "	4448 "	"	56.0 "

The results of the tests in the second series are showing in Table F.

Plot 210 was carefully hoed between the drill rows several times, at intervals of a few days. This hoeing was equivalent to root-pruning, and evidently had no beneficial effect.

Upon plot 212 muriate of potash, at the rate of 150 pounds per acre, was applied in the spring.

Plot 214 was covered with straw early in December to the depth of two or three inches. The Station notes show that this plot was not injured in the least by the severe weather of the winter. Throughout the entire season the wheat presented a strong, healthy, even growth.

The straw appeared to serve a double purpose, that of protecting the young plants from the severity of the winter, and by acting as a mulch, also protecting them from the drouth of summer.

TABLE F.

Number of plot.	Method of treatment.	Yield of grain per acre.	Yield of straw per acre.	Quality of grain.	Weight of measured bushel.
208	Ordinary for comparison	45.9 bush.	5408 pounds.	Good.	59.5 pounds.
210	Hoed	43.2 "	5664 "	"	60 "
212	Muriate of potash, 150 pounds per acre	42.8 "	5376 "	"	59 "
214	Mulched with straw	47.5 "	5920 "	"	59 "

EARLY AND LATE PLOWING AND SOWING.

Table G exhibits the results of these tests. The odd numbers were side by side on the south side of the road through the experimental field, and the even numbers on the north side of same road; consequently the best comparison is obtained by taking odd numbered plots by themselves and even numbered plots the same. The arrangement can be easily understood by reference to general plan of plots as given in this bulletin.

Thus plots 215 and 217 were plowed August 23d, the former was sowed August 25th, and the latter September 22d, combining early plowing and early sowing with early plowing and late sowing. The difference in yield per acre from these two plot is ten bushels in favor of the early plowing and late sowing. The quality of grain is slightly in favor of the latter.

In the same manner plots 216 and 218 might be compared, showing a difference of six and a half bushels in favor of early plowing and late sowing. The difference is not so great between these two plots, and this in all probability explained by plot 216 being plowed and sowed a week later than plot 215, which brought it nearer the ordinary seed time. Plots 217 and 218 it will be observed, were sowed the same date, though plowed at different dates. No just comparison can properly be made between these two, for as before stated, they are on opposite sides of the road, and the difference of soil renders it misleading and unreliable.

The same comparison between plots 219 and 221, and plots 220 and 222 reverses these results, and shows the yield to be in favor of the earlier sowing. The plan and results of this work deserve careful study and comparison of yield, time of plowing, and time of sowing.

Plots 223 to 226 followed each other at intervals of one week, making the last sowing October 13th. This plot had scarcely come up when cold weather set in and checked the growth, and from its appearance in early spring it was supposed to be entirely killed, yet it revived and made an excellent growth.

The ripening was so nearly even that all plots were marked ripe July 7th. A direct comparison between that sowed August 25th and that sowed October 13, showed the latter to be fully as well matured as the former, and the quality of grain was slightly in favor of the latter. This latest sown plot did not make so large a growth of straw as other plots. The quality of grain was quite even, there being but slight variations, and was all marked "good." Strength of straw varied slightly, the latest sowing having the preference. The weight of measured bushel varies considerably. It should be noticed that the heaviest weights are from the plots which show the largest yield.

TABLE G.

TIME OF SOWING.

Number.	Date of plowing, 1882.	Date of sowing, 1882.	Yield of grain.	Yield of straw.	Quality of straw.	Weight of measured bushel.
215	Aug. 23......	Aug. 25......	24.1 lbs.	2304 lbs.	Medium.....	56.0 lbs.
216	" 31......	Sept. 1......	40 "	4768 "	"	59.5 "
217	" 23......	" 22......	34.1 "	3552 "	"	56.5 "
218	" 31......	" 22......	46.5 "	4960 "	"	61.0 "
219	Sept. 8......	" 8......	34.9 "	3776 "	"	59.0 "
220	" 14......	" 15......	42.4 "	4640 "	"	59.0 "
221	" 8......	" 22......	31.7 "	3648 "	"	58.5 "
222	" 14......	" 22......	42.9 "	4800 "	"	59.5 "
223	" 22......	" 22......	36.9 "	3712 "	Strong........	60.0 "
224	" 29......	" 29......	47.1 "	4608 "	Medium......	61.0 "
225	Oct. 6......	Oct. 6......	34.7 "	3648 "	Strong........	58.5 "
226	" 13......	" 13......	38.0 "	3296 "	"	58.5 "

In order to simplify the above tabulated statement, we will divide the results of "early and late plowing," and also of "early and late sowing," into two series of three plots each.

EARLY AND LATE PLOWING.

SOUTH SERIES.

No. plot.	Date of plowing.	Date of sowing.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.
217	Aug. 23.........	Sept. 22.......	34.1 bushels.	3552 pounds.	56.5 pounds.
221	Sept. 8.........	" 22.......	31.7 "	3648 "	58.5 "
223	" 22.........	" 22.......	36 9 "	3712 "	60.0 "

EARLY AND LATE PLOWING.

NORTH SERIES.

No. plot.	Date of plowing.	Date of sowing.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.
218	Aug. 31.........	Sept. 22.......	46.5 bushels.	4960 pounds.	61.0 pounds.
222	Sept. 14........	" 22.......	42.9 "	4860 "	59.5 "
224	" 29.........	" 29.......	47.1 "	4608 "	61.0 "

This little experiment in early and late plowing is not all conclusive. The results are conflicting, and the test must be continued throughout a series of years before anything of value can be deduced.

The following report of the effect of late plowing for wheat was made by Mr. C. E. Thorne, late manager of the Ohio State University farm:

"About the first of August, 1879, a portion of a field of oat stubble, containing an acre of land, was plowed and the surface pulverized with the smoothing harrow. Nothing further was done until the 23d of September, when the land adjoining was plowed and the whole thoroughly pulverized and sown with Arnold's Gold Medal wheat on the 26th of September.

"The wheat sown on the earlier plowed strip, germinated promptly and grew finely; but that on the later plowing did not make its appearance for several days after the other, and then grew so much more slowly that the division between the two plowings could be distinctly seen until harvest.

"In March the whole was sown with clover-seed, but, while that on the earlier plowing made a fair catch, that on the later was almost a total failure.

"We harvested 24¾ bushels per acre of nice, plump grain from the earlier plowing, and 14⅜ bushels, badly shrunken, from the later."

EARLY AND LATE SEEDING.

SOUTH SERIES.

No. plot.	Date of plowing.	Date of sowing.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.
215	Aug. 23..............	Aug. 25..............	24.1 bush.	2,304 lbs.	56.0 lbs.
219	Sept. 8..............	Sept. 8..............	34.9 "	3,776 "	59.0 "
223	Sept. 22..............	Sept. 22..............	36.9 "	3,712 "	60.0 "
225	Oct. 6..............	Oct. 6..............	34.7 "	3,648 "	58.5 "

NORTH SERIES.

No. plot.	Date of plowing.	Date of sowing.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.
216	Aug. 31..............	Sept. 1..............	40.0 bush.	4,768 lbs.	59.5 lbs.
220	Sept. 14..............	Sept. 15..............	42.4 "	4,640 "	59.0 "
224	Sept. 29..............	Sept. 29..............	47.1 "	4,608 "	61.0 "
226	Oct. 13..............	Oct. 13..............	38.0 "	3,296 "	58.5 "

The results given in the last two tables are equally interesting and instructive. Plot 215, which was sowed August 25th, came up well, grew vigorously, and presented a good appearance until about October 1st. It was then evident that the Hessian fly was at work. Upon examination the larvæ were found, but not so abundantly as was expected.

A careful estimate showed about one-fifth of the plants affected, and from 12 to 15 per cent. of the wheat destroyed.

A few larvæ of the fly were found in plot 219, which was sown September 8th. The injury to the wheat, however, was scarcely perceptible to the eye. The most careful search failed to reveal any signs of fly in plot 216, which was sown September 1st. This plot belongs to the north series, where the soil is of better quality, and where the wheat was of ranker growth.

During the early part of June the larvæ of the Hessian fly were found doing some injury to plot 215. They were much less numerous than in the Fall. No larvæ were found in any of the later sown plots. Most of the straw of plot 215 stood erect, but the grain was quite badly shrunken.

The following experiments, under the direction of Dr. Townshend, reach results nearly like those of the Station:

In the wheat crop of 1879 we commenced a series of experiments designed to ascertain the proper time for sowing wheat in this neighborhood. Five sowings were made on bottom land; one each on the 9th, 16th, 23d, and 30th of September and 7th of October, in plots two rods wide by forty long, containing one-half acre each. The variety of wheat used was Clawson, and it was sown at the rate of six pecks per acre. The result was as follows:

That sown	September	9th,	yielded	33 2-10	bushels	per acre.
"	"	16th,	"	30 3-10	"	"
"	"	23d,	"	36 4-10	"	"
"	"	30th,	"	32 7-10	"	"
"	October	7th,	"	26 2-10	"	"

The first two sowings were perceptibly injured by the fly.

These experiments were continued in the crop of 1880, by making ten sowings on the same dates as those of 1879, two strips being sown on different portions of the field on each date, the strips being 1⅓ rods wide by 39 rods long, and containing one-third acre each. The soil selected this time was upland, with a westerly exposure. The variety used was Silver Chaff, sown at the rate of six pecks per acre. The result was as follows:

That sown	September	9th,	yielded	32¼	bushels	per acre.
"	"	16th,	"	33	"	"
"	"	23d,	"	33½	"	"
"	"	30th,	"	29½	"	"
"	October	7th,	"	26¼	"	"

In this case we found no indications of the fly.

Practical Conclusions.

1. Winter wheat may be sowed too early in the season or it may be sowed too late, so there must be a certain time, neither too early nor too late, which is the best date to put in the seed.

2. Many factors must be considered in designating the best time to sow. The condition of the soil, and the exposure, the presence of the Hessian fly, etc., must all be duly considered.

3. Early seeding does not secure an early harvest. The same variety sown under the same conditions will mature about the same time, whether the seeding be done the first of September or the first of October.

4. Wheat sown as late in the season as it can be, and still be given time to become firmly and strongly rooted, and time to develop leaves sufficient to cover the whole ground will best endure the winter.

5. The earliest sown wheat usually has the largest top and proportionally the smallest root; in the latest sown wheat the root is proportionally larger.

6. On poor soil and badly prepared ground the wheat should be sown earlier than upon rich soil and a well prepared seed-bed.

7. In this latitude the Hessian fly is not very troublesome in wheat sown later than September 25th.

8. The best date for sowing winter wheat in Central Ohio is from September 10 to September 30, according to the conditions mentioned above.

EXPERIMENTS WITH FERTILIZERS.

A tabulated statement of the kind and quantity of fertilizers applied per acre to each plot is given in table H. But one variety of wheat, Velvet Chaff, was used, and all the plots were sowed September 28.

All the fertilizers, with the exception of the "special wheat manure," were spread broadcast upon the surface before the wheat was drilled.

The "special wheat manure" was drilled in with the grain. The stable manure on plot 244 was well composted, being fine, and well decomposed when used. But one regular brand of commercial fertilizer was used, "Baker's Special Wheat Manure." This shows an analysis of 5½ per cent. of ammonia, 3 per cent. of potash, and 7½ per cent. of available phosphoric acid.

The chemical ingredients used were nitrate of soda, muriate of potash, and South Carolina rock phosphate. These were selected in order to test the comparative value of nitrogen, potash, and phosphoric acid. The nitrate of soda contained 15 per cent. of nitrogen, equivalent to 18 per cent. of ammonia. The muriate of potash contained 50 per cent. of potash. The South Carolina rock phosphate is only valuable for the phosphoric acid which it contains.

The above fertilizers were used separately and in various combinations, as shown by table H.

Table I exhibits in full the results in yield and quality of the grain and straw from the fertilized and unfertilized plots.

In comparing the results shown in table I, care should be taken to bear in mind the arrangement of the plots as shown in previous tables.

This is exhibited in table J. Comparing plot 227 with 229, (in the south series), there is an increase in yield of four bushels per acre by the use of 200 pounds of special fertilizer, which cost $2.25 per hundred pounds. Comparing plot 230 with 232 in the north series, there is a gain of 6.6 bushels by the use of 400 pounds of special wheat manure.

Comparing plot 232 with 234, there is a gain of 10.7 bushels by the use of 700 pounds of the fertilizer.

Taking thirty bushels per acre as the natural productive capacity of the soil of the south plots, as shown by numbers 229, 243, and 249, in table K, which were unfertilized, we find that with the exception of the "special wheat manure" above mentioned, and salt, the fertilizers applied had comparatively little effect. In no instance did they pay the cost of application.

Nitrate of soda applied at the rate of 300 pounds per acre to plot 235 had a decidedly injurious effect, reducing the product to 25.5 bushels.

Taking thirty-eight bushels per acre as the natural productive capacity of the soil of the north plots, as shown by numbers 232, 238, and 254, in table L, the results are the same. With the exception of the "special wheat manure," wood ashes, and lime, the fertilizers applied appeared to do more harm than good. This is true in the case of stable manure applied to plot 244 at the rate of thirteen tons per acre, the product being reduced to about thirty bushels per acre.

TABLE H.—KIND OF FERTILIZERS APPLIED.

SOUTH PLOTS.

Plot.	Kinds of fertilizers.		Amount per acre.
227	Special wheat manure		200 lbs.
229	Unfertilized		....
231	Special wheat manure		500 lbs.
233	Special wheat manure		600 "
235	Nitrate of soda		300 "
237	Muriate of potash		150 "
239	Mixture	Nitrate of soda	300 "
		Rock phosphate	400 "
241	Mixture	Rock phosphate	400 "
		Muriate of potash	150 "
243	Unfertilized		....
245	Mixture	Nitrate of soda	150 lbs.
		Rock phosphate	200 "
		Muriate of potash	75 "
247	Special wheat manure		800 "
249	Unfertilized		....
251	Plaster		600 "
253	Salt		5 bu.

NORTH PLOTS.

Plot.	Kinds of fertilizers.	Amount per acre.
228	Special wheat manure	300 lbs.
230	Special wheat manure	400 "
232	Unfertilized	....
234	Special wheat manure	700 lbs.
236	Rock phosphate	400 "
238	Unfertilized	....

TABLE H.—NORTH PLOTS—Continued.

Plot.	Kind of fertilizers.		Amount per acre.
240	Mixture	Nitrate of soda	300 lbs.
		Muriate of potash	150 "
242	Mixture	Nitrate of soda	300 "
		Rock phosphate	400 "
		Muriate of potash	150 "
244	Stable manure		13 tons.
246	Mixture	Nitrate of soda	75 lbs.
		Rock phosphate	100 "
		Muriate of potash	38 "
248	Special wheat manure		900 "
250	Lime		50 bu.
252	Wood ashes		75 "
254	Unfertilized		....

TABLE I.—FERTILIZERS APPLIED AND YIELD PER ACRE.

Plot.	Kinds of fertilizers.	Amount per acre.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.	Quality of straw.
227	Special wheat manure	200 lbs.	33.3 bu.	3,008 lbs.	57 lbs.	Strong.
228	Special wheat manure	300 "	46.5 "	4,832 "	60 "	Strong.
229	Unfertilized	....	29.3 "	3,004 "	57 "	Weak.
230	Special wheat manure	400 "	46.6 "	4,596 "	60 "	Weak.
231	Special wheat manure	500 "	43.7 "	4,384 "	60 "	Medium.
232	Unfertilized	....	40.0 "	4,768 "	57 "	Weak.
233	Special wheat manure	600 "	43.9 "	4,256 "	59 "	Weak.
234	Special wheat manure	700 "	50.7 "	6,848 "	59 "	Weak.
235	Nitrate of soda	300 "	25.5 "	3,552 "	58 "	Medium.
236	Rock phosphate	400 "	32.2 "	4,544 "	57 "	Weak.
237	Muriate of potash	150 "	31.1 "	3,394 "	57 "	Medium.
238	Unfertilized	....	36.3 "	4,432 "	58 "	Weak.
239	Nitrate of soda, 300 lbs. Rock phosphate, 400 lbs. } Mixed	700 "	31.6 "	3,568 "	55 "	Weak.
240	Nitrate of soda, 300 lbs. Muriate of potash, 150 lbs. } Mixed	450 "	36.5 "	4,640 "	56 "	Weak.
241	Muriate of potash, 150 lbs. Rock phosphate, 400 lbs.	550 "	32.9 "	4,552 "	57 "	Weak.
242	Nitrate of soda, 300 lbs. Rock phosphate, 400 lbs. Muriate of potash, 150 lbs.	850 "	34.8 "	4,688 "	56 "	Weak.
243	Unfertilized	....	30.8 "	4,424 "	55 "	Medium.
244	Stable manure	13 tons.	30.1 "	5,904 "	58 "	Weak.
245	Nitrate of soda, 150 lbs. Rock phosphate, 200 lbs. Muriate of potash, 75 lbs.	425 lbs.	30.1 "	3,408 "	56 "	Weak.
246	Nitrate of soda, 75 lbs. Rock phosphate, 100 lbs. Muriate of potash, 38 lbs.	213 "	34.7 "	5,296 "	56 "	Weak.
247	Special wheat manure	800 "	46.4 "	5,600 "	59 "	Strong.
248	Special wheat manure	900 "	49.6 "	7,756 "	55 "	Weak.
249	Unfertilized	....	30 "	4,864 "	55 "	Strong.
250	Lime	50 bu.	43.8 "	6,248 "	56 "	Weak.
251	Plaster	600 lbs.	29.3 "	4,512 "	55 "	Medium.
252	Wood ashes	75 bu.	48.9 "	5,728 "	58 "	Medium.
253	Salt	5 bu.	39.5 "	4.864 "	57 "	Medium.
254	Unfertilized	....	42.7 "	4,832 "	55 "	Weak.

TABLE K.—South Plots.

Plot.	Kind of fertilizer.		Amount per acre.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.	Quality of straw.
227	Special wheat manure		200 lbs.	33.3 bu.	3,006 lbs.	57.0 lbs.	Strong.
229	Unfertilized			29.0 "	3,004 "	57.0 "	Strong.
231	Special wheat manure		500 "	43.7 "	4,384 "	60.0 "	Medium.
233	Special wheat manure		600 "	43.9 "	4,256 "	59.0 "	Weak.
235	Nitrate of soda		300 "	25.5 "	3,552 "	58.5 "	Medium.
237	Muriate of potash		150 "	31.1 "	3,394 "	57.5 "	Medium.
239	Mixture	Nitrate of soda Rock phosphate	300 " 400 "	31.6 "	3,568 "	55.5 "	Weak.
241	Mixture	Rock phosphate Muriate of potash	400 " 150 "	32.9 "	4,552 "	57.0 "	Weak.
243	Unfertilized			30.8 "	4,424 "	55.5 "	Medium.
245	Mixture	Nitrate of soda Rock phosphate Muriate of potash	150 " 200 " 75 "	30.1 "	3,408 "	56.0 "	Weak.
247	Special wheat manure		800 "	46.4 "	5,600 "	59.0 "	Strong.
249	Unfertilized			30.0 "	4,864 "	55.0 "	Strong.
251	Gypsum or plaster		600 "	29.3 "	4,572 "	55.0 "	Medium.
253	Salt		5 bu.	39.5 "	4,864 "	57.0 "	Medium.

TABLE L.—North Plots.

Plot.	Kind of fertilizer.		Amount per acre.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.	Quality of straw.
228	Special wheat manure		300 lbs.	46.5 bu.	4,832 lbs.	60.0 lbs.	Strong.
230	Special wheat manure		400 "	46.6 "	4,896 "	60.5 "	Weak.
232	Unfertilized			40.0 "	4,768 "	57.0 "	Weak.
234	Special wheat manure		700 "	50.7 "	6,848 "	59.5 "	Weak.
236	Rock phosphate		400 "	32.2 "	4,544 "	57.5 "	Weak.
238	Unfertilized			36.8 "	4,452 "	58.0 "	Weak.
240	Mixture	Nitrate of soda Muriate of potash	300 " 150 "	36.5 "	4,640 "	56.5 "	Weak.
242	Mixture	Nitrate of soda Rock phosphate Muriate of potash	300 " 400 " 150 "	34.8 "	4,688 "	56.0 "	Weak.
244	Stable manure		18 tons.	30.1 "	5,904 "	58.5 "	Weak.
246	Mixture	Nitrate of soda Rock phosphate Muriate of potash	75 lbs. 100 " 38 "	34.7 "	5,296 "	56.0 "	Weak.
248	Special wheat manure		900 "	49.6 "	7,756 "	55.0 "	Weak.
250	Lime		50 bu.	43.3 "	6,248 "	56.0 "	Weak.
252	Wood ashes		75 "	48.9 "	5,728 "	58.0 "	Medium.
254	Unfertilized			42.7 "	4,832 "	55.5 "	Weak.

Practical Conclusions.

1. Under certain conditions of soil the application of concentrated fertilizers may do more harm than good.
2. The success or failure of the use of fertilizers at the Station, in one particular instance, should not be conclusive with others, since it cannot be proved that the needs of their soil are precisely like those of the experimental grounds.
3. The results obtained should incite the farmers of the State to experiment carefully and observe closely. To a certain extent each farmer must "prove all things" for himself, and should then "hold fast that which is good."
4. Untried and expensive fertilizers should be tested upon a small scale at first, and so applied that their effects or non-effects may be at once evident.
5. If after a single fair and impartial trial, a certain fertilizer produces no good results be not too swift to condemn or enter up judgment. If possible, vary the time and method of application, and try again. If the result be still void it may reasonably be concluded that the fertilizer in question, is not needed just there.

That some peculiarity of soil or climate renders its use ineffective at that point, though under other conditions it may be the best fertilizer known.

METHODS OF SEEDING.

Plots 255 to 267 comprise ridge culture, Lois Weeden culture, and plot sown for rotation.

Ridge culture is doubtless new to many farmers throughout the State.

Through the kindness of J. W. Sohn, of Hamilton, Ohio, manufacturer of ridge culture implements, the Station was presented with an improved Ridge Drill last fall, which was used in planting the experiments in ridge culture.

But little can be said of this work except to state the facts as they appear in the table. One year's work is by no means sufficient to test any method of culture. A better knowledge of how to use these implements may show ridge culture to be of importance in the cultivation of both wheat and corn.

The various amounts of seed used per acre are shown in the table. It will be seen by reference to plan of plots that the ridge culture with five pecks per acre, the broadcast five pecks per acre, and the common drill five pecks per acre were sown side by side, and that the ridge and common drill six pecks per acre were side by side, and had as nearly equal conditions as was possible.

The very low yield of plot 258 (ridge drill, five pecks), is accounted for by the fact of imperfect distribution of the seed.

TABLE M.—SOUTH PLOTS.

Plot.	Amount of seed per acre.	Method of seeding and culture.	Yield of grain per acre.	Yield of straw per acre.	Quality of grain.	Quality of straw.	Weight of measured bushel.
255	2 pecks......	Ridge	24.8 bush	2268 lbs.	Fair........	Strong ...	56 lbs.
257	4 "	"	30.3 "	2716 "	"	" ...	57 "
259	6 "	"	35.3 "	3192 "	Poor	" ...	55.5 "
261	6 "	Com. drill..	48.3 "	4224 "	V. good ..	Medium..	59.5 "
263	6 "	L. Weeden.	33.9 "	3104 "	" ..	" ...	59 "
265	6 "	Ordinary ...	34.4 "	2496 "	" ..	" ...	59 "

TABLE N.—NORTH PLOTS.

Plot.	Amount of seed per acre.	Method of seeding and culture.	Yield of grain per acre.	Yield of straw per acre.	Quality of grain.	Quality of straw.	Weight of measured bushel.
256	3 pecks......	Ridge	31.1 bush	3276 lbs.	Fair........	Strong ...	59 lbs.
258	5 "	"	20.4 "	2856 "	"	" ...	59 "
260	5 "	Broadcast...	32.4 "	2667 "	"	Medium..	58.5 "
262	5 "	Com. drill...	48.5 "	4608 "	Good......	" ..	59 "
264	6 "	L. Weeden.	43.7 "	2592 "	"	Strong ...	60.5 "
266	6 "	Ordinary ..	43.8 "	3856 "	V. good ..	" ...	60.5 "

The essential features in "ridge culture" of wheat may be briefly summed up as follows: The seed is distributed directly upon the surface in drill rows six inches wide, and is covered by a series of hoes or shovels which leave a distinct furrow between the seed beds.

Among the advantages claimed are, (1), The better distribution of the seed (2), The better utilization of the fertile surface soil; (3), More perfect surface drainage.

Owing to the peculiarities of the season, the test in "ridge culture" was not altogether satisfactory.

That it presents some points of excellence not found in the common method of seeding, cannot be disputed. That it does not show better results upon the first trial at the Experiment Station is no reason why it should be condemned. A more thorough trial of the system is now in progress, the results of which will be published in due time.

WHEAT TESTS IN DIFFERENT PARTS OF THE STATE.

In order to ascertain the comparative value of certain varieties of wheat in various sections of the State, the Station endeavored to secure the co-operation of representative farmers in different localities to make a few simple tests.

One bushel each of two varieties of wheat were sent to twenty different points.

The varieties sent out were Velvet Chaff, Silver Chaff and Sandomirka: The former a variety of known merit in many localities but unknown in others, while the latter two varieties are not so generally known but possessing some desirable qualities.

The Velvet Chaff was sent to each of the twenty men who promised to give two varieties a trial. While the Sandomirka and Silver Chaff was about evenly divided.

It was the wish of the Station to have these varieties carefully tested in all the principal wheat growing districts of the State.

Unfortunately the season proved very unfavorable for the trial, and only twelve of the twenty promised experimenters made any report. Of these twelve, two report entire failures.

The wheat was sent out about September 1, 1882. The following blank was sent to each one receiving the wheat:

THE OHIO AGRICULTURAL EXPERIMENT STATION.
STATE UNIVERSITY,
COLUMBUS, OHIO, *September* 4, 1882.

MR. ——— ———,
P. O., ———, Ohio ———.

DEAR SIR:—I send you to-day by express one bushel each of the following varieties of wheat:

Will you give them a fair and impartial trial and report the results. In making the test please answer the following questions in the appropriate blanks, and when the record is complete, send it to my address.

WILLIAM R. LAZENBY, *Director*.
Columbus, Ohio.

1. Character of soil and previous management.
2. Preparation of soil, time and depth of plowing, etc.
3. Date of sowing; area sown and quantity of seed per acre.
4. Date of harvesting.
5. Yield per acre, and weight per measured bushel.
6. Is the quality of grain harvested equal to that sown, and how does it compare in yield and quality with the varieties now generally grown in your locality.

General remarks.

In the above outline ruled lines sufficient for giving a full description were left between each heading.

The reports which came in were for the most part well made out and very satisfactory; occasionally some minor point would be omitted.

The following statement shows the general results of this work, as compiled from the reports:

STATEMENT EXHIBITING RESULTS OF WHEAT TESTS IN DIFFERENT PARTS OF THE STATE.

Counties.	Name.	Variety.	Soil.	Time of sowing.	Time of ripening.	Yield from one bushel of seed.		Quality of grain.	Quality of straw.	Weight of measured bushel.
				1882.	1883.	*Bu.*	*Lbs.*			*Lbs.*
Seneca	Samuel Koch	Velvet Chaff	Dry and gravelly	Sept. 16	July 11	14	30	Good.	Good.	62
Seneca	"	Silver Chaff	"	" 16	" 12	18	12	Poor.	"	59
Butler	W. F. Brown	Velvet Chaff	Heavy clay	" 29	" 7	8	...	"		55
Butler	"	Silver Chaff	"	" 29	Failure.					
Williams	J. J. Rudisill[3]	Velvet Chaff	Gravelly, sandy soil	" 11	July 10	10	30	Good.	Good.	
Williams	"	Silver Chaff	" "	" 11	" 13	14	50	"	"	
Huron	Geo. Lambkin	Velvet Chaff	Gravelly, clay soil	" 19	" 13	22	30	"	"	63
Huron	"	Silver Chaff	" "	" 15	" 10	7	...	Poor.		58
Fulton	Albert Deyo	Velvet Chaff	Clay loam	" 12	" 12	10	6	Good.	Good.	60
Fulton	"	Silver Chaff	"	" 12	" 18	9	...	Poor.	Poor.	54
Lake[1]	E. W. Taylor									
Medina	F. G. Cottingham	Velvet Chaff	Clay loam	Sept. 26	July 18	13	30	Good.	Good.	
Medina	"	Sandomirka	"	" 26	" 18	9	...	Poor.	Poor.	
Belmont	J. B. Hoge	Velvet Chaff[4]								
Belmont	"	Sandomirka	Black soil	Sept. 21	July 10	12	...	Good.	Poor.	60
Defiance	J. B. Elliott	Velvet Chaff	Gravel and loam	" 21	" 11	9	48	Poor.		53½
Defiance	"	Sandomirka	"	" 21	" 11	7	46	"		52
Hancock	G. W. Powell	Velvet Chaff	Sandy loam	" 28	" 10	26	...	Good.	Good.	61
Hancock	"	Sandomirka	"	" 28	" 16	15	...	Poor.	Poor.	
Washington	S. S. Devol	Velvet Chaff	Limestone	Oct. 9	June 28	22	43	Good.	Good.	62
Washington	"	Sandomirka	"	" 8	July 9	17	23	"	Poor.	64
Clinton[2]	Leo Weltz									

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[1] Velvet Chaff and Silver Chaff both killed by severe freeze.

[2] Velvet Chaff and Sandomirka both destroyed by hail storm, May 28, 1883.

[3] Mr. Rudisill was killed by an accident, and a friend of his, Mr. C. A. Fyke, kindly filled up and returned the blanks to the Station.

[4] Failure; killed by freezing.

The above statement is as full and comprehensive as it is possible to make from the data at hand. Velvet Chaff is reported as failing but once when others did not fail, and that from Belmont county. It, with others, failed in Lake county, and was destroyed by hail in Clinton. Silver Chaff is reported a failure once only where others did not fail, and Sandomirka was not reported an entire failure from any county.

Nearly all kinds of soil are represented in the test.

The yield from the bushel of seed sent out varies in the case of Velvet Chaff from eight bushels in Butler county, to twenty-six bushels in Hancock county, and shows an average from all counties reporting of fifteen bushels and seventeen pounds from one bushel of seed. In but one or two instances were the other varieties spoken of in commendable terms.

The quality of grain and straw deserve attention, as in almost every instance Velvet Chaff is marked good and the others poor.

The principal objections to Sandomirka and Silver Chaff are, lateness of ripening, unevenness in length of straw, tendency to rust, etc. It is also reported that Velvet Chaff rusted in several places. The following brief quotations are taken from the notes of the parties reporting:

Seneca County.—Velvet Chaff: "better yield and better quality than is generally grown here; would consider this a good wheat for this part of the State. Silver Chaff: "shrunken some; straw stiff and bright, without rust; eight days later than Velvet Chaff." Mr. Koch does not in his notes offer any explanation of the larger yield of Silver Chaff.

Butler County.—Velvet Chaff: "quality about same as Fultz and Rice; all of my wheat is shrunken." Silver Chaff: "not worth cutting."

Williams County.—Velvet Chaff: "good plump seed; straw short and stiff; think it an excellent wheat; used no fertilizer, and ground had been hard run." Silver Chaff: "later than other varieties here; good plump grain; difference in yield is due to manure used with Silver Chaff."

Huron County.—Velvet Chaff: "compares *favorably* with other varieties; berry plump, of bright color; straw strong. Silver Chaff: "quality not good as sown; somewhat shrunken." In this test Mr. Lambkin gave the varieties to two other gentlemen, hence they were not grown on the same farm, but apparently had similar treatment. The date of ripening which places Silver Chaff first can be explained in no other way than that of difference of soil, yet both gentlemen give the soil in almost the same words.

Fulton County.—Velet Chaff: "straw short; matures early; have reason to believe it is well adapted to our climate." Silver Chaff: "straw six inches taller; six or eight days later; badly shrunken; believe it not adapted to our climate." Mr. Deyo distributed the Velvet Chaff one-half bushel to each township in the county for further experiment. This is a very commendable example.

Medina County.—Velvet Chaff: "yield would average with other varieties here; we are pleased with it; straw short." Sandomirka: "shrunken; tall; rusted."

Belmont County.—Velvet Chaff, failed. Mr Hoge says: "looked well until March, and was killed by the freeze." We wish to say this was very singular for Velvet Chaff to be killed when Sandomirka was not, and that possibly there was a mistake either in sending out the seed or in some way it got changed. Sandomirka: "not so good as Fultz; very poor year for wheat in this locality."

Defiance County.—Mr. Elliott says: "of all varieties grown in his locality that very little is equal to seed sown."

Hancock County.—Velvet Chaff: "quality good; not equal to Valley; plump and bright; stood winter well; straw short and bright; believe it will prove valuable." Sandomirka: "am disgusted with it; very uneven straw; badly rusted; six or eight days later than other varieties.

Washington County.—Velvet Chaff: "quality not so good as sown; stood the winter well; ripened even." Sandomirka: "quality better than that sown; winter killed badly; but made fair stand; ripens late."

ADDITIONAL REPORT.

The following report of wheat experiments was kindly furnished the Station by Mr. Geo. Burr, of Lodi, Medina county, Ohio, who certainly deserve great credit for his careful work in testing such a large number of varieties.

The report is given in full as furnished by Mr. Burr, but for the sake of making one or two points somewhat clearer the following notes or references are made to his statement as here appended:

The plots as numbered by him, one and two, were divided into a sufficient number of small beds to accomodate all the varieties. The object of the two sets of beds evidently was to test the same varieties under different conditions. It appears that the beds of plot No. 1 were partly protected from the severe freezes by snow, and that two estimates of per cent. winter killed were made for each bed, one for part covered and the other for part exposed.

The beds of plot No. 2 it appears were entirely exposed to the severe winter, hence the high per cent. winter killed. These yields are all calculated from the beds in plot 1.

Two plots were set apart for experiment: Plot No. 1 on sandy loam. Plot No. 2 on river bottom, black soil, with no gravel.

Each bed contained 198 square feet equal to the two hundred and twentieth part of an acre. These beds were sown with the different varieties of wheat at the rate of 68 pounds per acre. During part of the severe cold weather last winter one-half of nearly all the beds in plot No. 1 was protected with snow. The wintering of the wheat is marked by the per cent. winter killed.

Variety of wheat.	Plot No. 1, sown September 28, notes May 1, per cent. winter killed.		Plot No. 2 sown Oct. 4, per cent. winter killed.	Date of harvesting.	Bearded or smooth.	Quality of straw.	Yield per acre.	
	Protected.	Unprotected.					Bu.	Lbs.
Democrat	40 per cent.	80 per cent.	80 per cent.	July 14	Bearded	Medium	12	32
Wayne County Select	40 “	50 “	70 “	“ 14	“	“	19	29
Grecian	50 “	80 “	70 “	“ 14	Smooth	“	12	50
Martin's Amber	40 “	50 “	50 “	“ 14	“	Strong	21	32
Landreth	30 “	40 “	50 “	“ 14	“	“	23	28
Golden Prolific	60 “	80 “	90 “	“ 14	Bearded	“	26	...
Roscoe	30 “	40 “	80 “	“ 11	Smooth	“	26	28
Sandomirka	20 “	30 “	50 “	“ 11	“	“	32	54
Canada Club	30 “	40 “	50 “	“ 11	Bearded	“	33	17
Rogers	20 “	30 “	60 “	“ 14	Smooth	Medium	26	38
Fultz	20 “	30 “	60 “	“ 11	“	Strong	31	18
Tasmanian	20 “	30 “	60 “	“ 14	Bearded	Medium	28	7
Spark's Swamp	20 “	30 “	40 “	“ 14	“	Weak	29	40
California Blue Stem	20 “	30 “	40 “	“ 14	“	“	34	25
Lancaster	20 “	30 “	40 “	“ 14	“	“	29	54
Velvet Chaff	20 “	70 “	20 “	“ 9	“	Strong	37	31
Mammoth Red	30 “	50 “	40 “	“ 16	Smooth	Medium	16	34
Hedges Prolific	40 “	70 “	40 “	“ 9	“	Strong	31	18
Tappahannock	80 “	90 “	60 “	“ 14	“	Medium	22	55
York White Chaff	30 “	50 “	60 “	“ 14	“	Strong	30	39
Smith's Scott	30 “	50 “	60 “	“ 14	Mixed	“	30	42
Russian May			20 “	“ 9	Smooth	Weak	22	20
Finley		80 “	40 “	“ 14	“	“		
Yellow Blue Stem		50 “	40 “	“ 14	“	“		
Bennett		40 “	20 “	“ 14	Bearded	“		
Scott's Emporium		60 “	40 “	“ 14	Mixed	“	14	29
Zimmerman		60 “	40 “	“ 14	Smooth	Medium	19	50
Clawson				“ 14	“	“	12	50
Red Velvet		20 “		“ 14	“	Strong		

Part of the above varieties were sown on clay soil in the adjoining town of Chatham, notes were only taken on this plot.

All of the above varieties were slightly affected with rust.

The Black Bearded Centennial and Golden Grains entirely froze out.

Democrat was the best on the clay plot. Only a very small part of the bed was protected with snow, which is the cause of the small yield.

Wayne County Select and Grecian rusted badly.

Martin's Amber and Landreth are very near alike, they teathered out from the root in the spring remarkably, and made one-third more straw than any variety; the straw was bright; heads not well filled, and some abortive flowers noticed.

Roscoe, blighted and rusted badly.

Golden Prolific and Rogers rusted considerably. The first is profuse with beards.

Tasmanian Red, Spark's Swamp, California Blue Stem and Lancaster are nearly alike.

Velvet Chaff, good on clay.

Russian May is very beardy; heads very short.

Finley, Yellow Blue Stem and Bennett lodged so badly that we did not secure wheat enough to test the yield per acre on plot No 1.

The Bennett on plot No. 2 was one of the best, the straw being quite strong there.

Zimmerman, Clawson, and Red Velvet rusted considerably. The Clawson was not sown until October 12. The Red Velvet was not a full bed.

A number of white wheats have so changed in color this season that I cannot recognize them as white.

The yield per acre is calculated from plot No. 1.

RESULTS OF FOUR YEARS' TRIAL.

The following table exhibits the results of tests with varieties made at the State University Farm, during the years 1880, 1881, 1882, and 1883. While it cannot be claimed that these figures give the exact comparative values of the different varieties named, for all parts of the State, they afford some interesting comparisons in regard to productiveness and weight of grain.

As will be seen from the table, only a few varieties were tested in 1880, and the weights are not given. For this soil and climate the Yellow Missouri has proved a failure. Clawson, Fultz, and Velvet Chaff were grown for several years prior to 1880, yielding uniformly good crops.

The yield of 1883 is unusually large, while the weight is unusually low.

Varieties.	Yield of grain per acre—bushels.				Weight of grain per bushel.		
	1880.	1881.	1882.	1883.	[1]1881.	[1]1882.	[2]1883.
American White	....	19	21	....	59½	59½	....
Arnold's Gold Medal	31	19½	27	....	60	56	....
Bearded Treadwell	....	....	....	41.09	....	....	55½
Bennett	....	....	28½	32.12	....	62	50½
Champion Amber	....	23	21	40.32	57½	56	57
Clawson	26	23	27	....	59	57	....
California Blue Stem	....	....	24	....	....	59	....
Democrat	....	....	....	45.55	....	....	60
Egyptian	....	22	27	44.33	59	59½	57½
Finley	....	....	22½	46.33	....	58½	58
Fultz	27	21½	19½	....	61	61	....
German Amber	....	24½	21	....	62½	57	....
Golden Straw	28	19½	19½	42.70	60½	62	58½
Grecian	....	20	24	37.10	58½	59½	52½
Heige's Prolific	....	19	21	43.73	61½	59	58
Hungarian	....	21	28½	....	62	59½	....
Indiana Swamp	....	23½	27	....	61	58	....
Lancaster	....	23½	27	40.13	57	60	57
Mammoth Red	....	12½	27	....	57½	60	....
McGhee's Red	....	26	25½	40.60	62	58	57
Mediterranean	....	21½	27	....	59	59½	....
Michigan Amber	....	21½	24	....	59½	59	....
New Zealand	....	....	27	....	....	56	....
Ostrey	....	....	....	36.43	....	....	59
Red Amber	....	25½	22½	....	61	59½	....
Rice	....	....	27	40.33	....	58	56½
Rickenbrode	....	19½	10½	....	58½	59½	....
Russian No. 2	....	17	30	37.20	62½	62	58
Russian May	....	....	28½	32.26	....	62½	57
Rocky Mountain	....	....	....	35.30	....	....	57
Rodgers	....	....	....	37.66	....	....	55½
Sandomirka	30	26½	28½	41.06	63	63	58
Smooth Scott	....	26½	25½	35.93	61½	61	54½
Siberian	....	26½	25½	....	61½	61	....
Silver Chaff	33	26	28½	39.00	59½	52½	54½
Smith's Scall	....	....	22½	....	....	57½	....
Smith's Improved	....	16½	21	....	59½	60	....
Smooth Treadwell	....	....	....	36.24	....	....	54
Tappahannock	....	16½	24	....	61	63	....
Theiss	....	25	16½	....	62½	59	....
Travis	....	....	18½	34.15	....	60	58½
Tennessee Amber	....	....	....	30.00	....	....	59
Velvet Chaff	28	22½	27	35.21	64	64½	59½
Washington Glass	....	....	27	....	....	56	....
Wayne County Select	....	....	....	48.00	....	....	56
White Eldorado	....	....	21	....	....	58	....
White Blue Stem	....	....	22½	44.31	....	57½	57½
White Glass	....	....	27	....	....	58	....
Yellow Blue Stem	....	....	21	45.17	....	60	58
Yellow Missouri	....	12	16½	....	57½	57	....
York White Chaff	....	26	21	39.73	59	61	56½
Zimmerman	....	26	30	33.12	61	58½	54½

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[1] As cleaned for seed.

[2] As from machine.

From the foregoing table, the following interesting averages are made:

AVERAGE YIELD AND WEIGHT OF RED WHEAT COMPARED WITH WHITE WHEAT.

	Average yield.			Average weight.		
	1881.	1882.	1883.	1881.	1882.	1883.
	bus.	bus.	bus.	[1]lbs.	[1]lbs.	[2]lbs.
Red	21.6	24.1	38.9	60.1	57.9	57.5
White	20.8	24.6	35.5	60.	59.5	55.6

AVERAGE YIELD AND WEIGHT OF SMOOTH WHEAT COMPARED WITH BEARDED WHEAT.

	Average yield.			Average weight.		
	1881.	1882.	1883.	1881.	1882.	1883.
	bus.	bus.	bus.	[1]lbs.	[1]lbs.	[2]lbs.
Smooth	20.2	23.5	37.6	59.7	59.2	56.9
Bearded	22.5	24.6	42.7	60.7	59.5	57.4

[1] As cleaned for seed. [2] As from machine.

VITALITY OF DIFFERENT CLASSES OF WHEAT.

The following table has been compiled from the Station record of germination tests. About half a dozen varieties of each class were tested, all from the crop of 1883. The details will be found under the report of seed tests.

Class of wheat.	Average per cent. germinated.			
	Selected ears.	Average ears.	Small ears.	Average of all ears.
Large Red Varieties	92.67	93.67	97.00	94.44
Medium Red "	95.14	95.71	96.57	95.81
Large White "	83.14	84.86	86.86	84.95
Medium White "	58.00	52.00	80.00	63.33
Small White "	86.00	80.00	92.00	86.00
All Large "	85.23	86.62	91.54	89.08
All Medium "	90.50	90.25	93.75	91.88
All Red "	94.00	94.93	96.83	95.25
All White "	80.67	80.67	86.67	82.67
All varieties	88.55	89.09	92.64	90.09

ANALYSES OF WHEAT AT DIFFERENT STAGES OF RIPENESS.

A great diversity of opinion exists respecting the degree of ripeness at which wheat should be cut, in order to secure the best results. It is claimed by many that a large part of the gluten is formed near the close of the period of ripening. Others claim that the hard, perfectly ripened wheat is no richer in gluten than the softer grain of early cutting.

In order to throw some light upon this question, the Station has made some chemical analyses of wheat at different stages of ripeness.

Three varieties, Velvet Chaff, Fultz and Egyptian or Gipsey, were selected. A small sheaf of each was cut June 22d and June 30th and July 2d. These were carefully labeled and placed in a dry, well ventilated room. Each sample was treated precisely alike. When thoroughly dry the wheat was threshed by hand, cleaned and carefully preserved until analyzed.

The analyses were made by Prof. N. W. Lord, Chemist of the Station, who presented the following report upon the completion of his work. The samples were given to the chemist by numbers alone, and the name of the variety and date of cutting have been inserted by the director:

Prof. W. R. Lazenby, Director:

DEAR SIR.—Before giving the following results of the analyses of the samples of wheat which you submitted to me, the method pursued will need a little explanation. The whole grain (kernel) was pulverized and sifted through a twenty-five-mesh sieve. This sample so prepared served for the determination of moisture, total albuminoids and ash, the total albuminoids being determined by estimating the amount of nitrogen present and multiplying it by 6.25. These nitrogen determinations were made by combustion with soda-lime.

In order to examine the proximate composition of the grain, the following method was pursued:

A weighed amount of the pulverized grain, which, for this purpose, was ground to as fine a powder as possible, was mixed with a little cold water to a stiff dough. This was then carefully washed in cold water, saving all the liquid, until a clean mass of gluten remained and the wash water ran off clear. This "gluten" was then washed in ether, dried to constant weight and its final weight recorded. Duplicates by this process gave very concordant results. The milky liquid containing starch granules in suspension, together with the husk and seed coats of the grain, (from which the gluten rapidly frees itself in washing), was then filtered through fine bolting cloth, and the residue of husk and shell washed with water, dried and weighed, all the starch passing through the cloth. This "husk" determination was made as affording an index of the per cent. of the flour-making part of the grain. Its composition approximates closely to that of the "bran" obtained in milling flour. Direct experiment showed that it contained 13.75 per cent. of albuminoids.

The starch granules and modified starch in the liquid which passed through the bolting cloth were then estimated by difference, by subtracting from the weight of the grain its contents in "husk and seed coats," plus the ash, plus the water, plus the albuminoids, (corrected for the amount in the husk above stated.)

From the gluten found as above in all cases 1.1 per cent. was deducted, corresponding to the ash and fat which it contains. From the total amount of albuminoids in the grain, the amount in the husk and the gluten being deducted, the remainder was considered as "soluble albuminoids."

The above method of proximate analysis was adopted as perhaps preferable to the simple determination of *all* the albuminoids, and then the small residue of "woody fibre" in the grain, in that it seemed to show the flour yielding character of the grain more completely.

No 1.—VELVET CHAFF.

	Date of cutting.		
	June 22, 1883.	June 30, 1883.	July 2, 1883.
Water	12.10	12.65	11.25
Gluten	8.72	11.45	12.15
Husk and seed coat	17.60	12.90	11.25
Other albuminoids	3.11	1.65	2.35
Starch, sugar and fat	56.22	61.55	60.95
Ash	2.25	1.80	1.95
Total albuminoids	14.25	14.87	15.75

No. 2.—EGYPTIAN.

	Date of cutting.		
	June 22, 1883.	June 30, 1883.	July 2, 1883.
Water	10.80	12.00	10.50
Gluten	9.07	8.33	8.85
Husk and seed coat	14.28	14.70	12.37
Other albuminoids	1.83	1.90	3.20
Starch, sugar and fat	61.72	61.37	63.18
Ash	2.30	1.70	1.90
Total albuminoids	12.87	12.25	13.75

No. 3.—Fultz.

	Date of cutting.		
	June 22, 1883.	June 30, 1883.	July 2, 1883.
Water	10.50	12.65	12.80
Gluten	7.88	9.25	9.70
Husk and seed coat	16.20	10.95	12.05
Other albuminoids	2.76	2.05	1.34
Starch, sugar and gum	60.36	63.20	62.81
Ash	2.30	1.90	1.80
Total albuminoids	12.87	12.87	12.65

N. W. LORD, *Chemist.*

Attention is called to the following points: While the variation in total albuminoids in the three samples of each variety is comparatively slight, the variation in the gluten is more marked. There is also a wider difference in the proportion of husk and ash.

The three varieties were selected because the progress of ripening appeared to be uniform in each. The first samples were cut when the kernels had attained full size, but were in the milk state. The straw was quite green; the heads were just beginning to turn yellow.

After the first cutting there were heavy rains, and the wheat matured slowly. Not until eight days had passed was the wheat fully in the dough. At this time the second cutting was made. The straw was yellowish green. When crushed the berry showed just a trace of milk. After curing in the straw the kernels had a clear, plump appearance.

The third cutting was made two days later. During this time the change had been rapid; the berry was dry, and becoming hard; straw nearly ripe.

Other varieties were examined at the same dates, and some samples were preserved, but the above named were selected for analysis because, as far as one could judge, they were at the same stage of maturity when cut. The condition of the weather undoubtedly had much to do with the rapid change between the second and third cutting.

WHEAT TESTS IN PROGRESS.

Many of the tests reported are being repeated the present season. And the work is being extended just as fast and far as the means at the command of the Station will warrant.

It is believed that continuous field experiments with the same crop, on the same plot, year after year, is the best method of securing results of the highest value.

Wheat is one of our most important cereal crops. In all civilized countries it is the leading article of food for man. It is one of the principal sources of revenue to the State. The object of the Station in its experiments with wheat is to do something toward increasing the yield, improving the quality, and decreasing the cost of production of this valuable crop.

EXPERIMENTS WITH CORN.

The experiments and tests with corn during the summer of 1883 were upon the same general plan as those of 1882. Having more land at our command, some of the tests were considerably enlarged and a number of new ones made.

For sake of convenience, the corn tests have been divided into the following general heads:

1. *Comparison of varieties.*
2. *Planting at different depths.*
3. *Thick and thin seeding.*
4. *Methods of culture.*
5. *Application of fertilizers.*

TEST OF VARIETIES.

This work embraced a comparative study of sixteen so-called varieties of corn.

Before giving the results in detail, attention is called to a few points regarding the classification of corn.

Classification.

Indian Corn or Maize appears to be divided into five well marked races or tribes, viz: *Dent corn*, *Flint corn*, *Sweet corn*, *Pop-corn*, and *Soft corn*. These may each be divided into sub-races, which in turn may be divided into an almost innumerable number of varieties.

The different varieties of corn are distinguished by the following points:

1. Color.
2. Number of rows.
3. Shape and size of grain.
4. Hardness and chemical composition of grain.
5. Shape and size of ear.
6. Size and color of cob.
7. The time of maturity.
8. Length and thickness of husk.
9. Number of ears on single stalk.
10. Character of node and internode.

There are are probably other characters of more or less importance, such as color of anthers, ærial roots, tendency to sucker, etc.

The following classification may be useful:

	Race.	*Sub-race.*
Indian Corn or Maize	Dent	Western.
		Southern.
		Eight-rowed.
	Flint	Northern.
		New England.
		Hominy.
	Sweet	Twelve-rowed (wrinkled.)
		Eight-rowed (smooth.)
	Pop	Common.
		Pearl.
		Rice.
	Soft	Northern.
		Tuscarora.

Each of the sub-races may be divided into classes and sections. To illustrate, let us examine the sub-race Western, of the race Dent:

Race.	*Sub-race.*	*Class.*	*Section.*
Dent	Western	1. Yellow	1. Large.
			2. Medium.
			3. Small.
		2. White.	
		3. Red.	
		4. Blue or Black.	

A classification something like the above is simple, easily understood, and if generally adopted when writing or speaking about corn, would save much confusion.

For instance, if one was wholly unacquainted with the varieties known as Leaming or Porter, and should simply hear these names mentioned, he would have no idea of the corn referred to. By using the classification just mentioned, these varieties would be well described as large, yellow, Western, Dent. If instead of simply using the name "Chadwick," a speaker or writer would say a small, yellow, New England Flint, we would have a much better idea of what he was talking about.

This form of expression would not interfere with variety names that should always be given to well established types. Mr. Brown could grow and sell his peculiar type of large, yellow, Western Dent, and Mr. Smith his distinctive type of small, white, Northern Flint, with just the same certainty of its being known as Brown's or Smith's corn as now.

Of the five races of corn the Dent is by far the most largely grown in Ohio, and the tests made at the Station have been confined mainly to this race, with its various sub-divisions. Most of the varieties tested belong to the sub-race Western, and the two classes, yellow or white.

The Station used sixteen varieties for testing the past season. Following the outline or synopsis previously given, these varieties would be classified as follows:

Varieties of corn used in field test, 1883.

- 1. Dents (Western)
  - 1. Yellow ...
    - 1. Large types...
      - 1. Leaming.
      - 2. Newton.
      - 3. Chester County Mammoth.
    - 2. Small types...
      - 1. Wright's Golden.
      - 2. Premium Dent.
      - 3. Sibley's Pride of the North.
      - 4. North Star.
  - 2. White.....
    - 1. Large types...
      - 1. Rural (Benton's.)
      - 2. Parrish.
    - 2. Small types...
      - 1. Blount's Prolific.
- 2. Flints (N. England)
  - 1. Yellow ...
    - 1. Large types...
      - 1. Waushakum.
      - 2. Early Yellow Dutton.
      - 3. King Philip.
    - 2. Small types...
      - 1. Chadwick.
  - 2. White.....
    - 1. Large types...
      - 1. Long Flint.
    - 2. Small types...
      - 1. Silver Houghton Farm.

This gives of large yellow dents three varieties; small yellow dents four varieties; large white dents two varieties; small white dents one variety; and of large yellow flints three varieties; small yellow flints one variety; large white flints and small white flints one variety, each.

The plots were all planted June 7th.

The soil of the field is a clay loam, underlaid with gravel, but at this particular place there are strong traces of black muck, and the soil loses considerably its clayey character.

The plots were so placed as to make the character of the soil quite uniform for the entire series.

The following diagram "A," gives the arrangements of the plots. The demands upon our space were so pressing that the size of these plots was reduced to a little less than one fourth the ordinary experiment plot, by taking four ordinary plots and cutting them into four cross sections as shown in the diagram.

Decreasing the size of the plot has the advantage of securing more even quality of soil.

DIAGRAM A.

350 A. Leaming.	350 B. Newton.	350 C. Rural (Benton.)	350 D. Parish.
352 A. Wright's Golden.	352 B. Chester Co. Mammoth.	352 C. Premium Dent.	352 D. Sibley's Pride of the North.
354 A. North Star.	354 B. Blount's Prolific.	354 C. Waushakum.	354 D. Early Yellow Dutton.
356 A. Chadwick.	356 B. Silver Houghton Farm.	356 C. Long Flint.	356 D. King Philip.

The rows were three and a half feet both ways, and just four kernels put in each hill. Care was exercised to do this work exact as the intention was not to replant under any consideration. After allowing sufficient time for germination, the sprouts were counted in each plot, and the per cent. which did not come recorded in "field notes" which will be given in table IV. When the young plants had attained sufficient size to insure them against future injury by insects or any of the ordinary causes which tend to destroy the stand, the hills were all thinned to three stalks in case they contained more; after cultivation was completed the stalks were again counted to ascertain what per cent. of a perfect stand would be harvested. Then considering the results as given in table I (which are the actual results of weights made in the field) as such a percentage of a perfect crop, the results as found in table III were obtained. This gives the correct yields or what it would have been with a perfect stand. The per cent. which germinated varied very much, and will be fully discussed under table III.

The following table gives the results in regard to yield of corn and stalks, as it was weighed from the field; also the time of ripening and number of days required for maturity:

TABLE I.

	Variety.	Bushels sound corn, 70 pounds each.	Bushels soft corn, 70 pounds each.	Total bushels, 70 pounds each.	Weight of stalks.	Time of ripening.	Days required to mature.
					Pounds.		
1	Leaming	76.6	5.7	82.3	7,878	Sept 21	106
2	Newton	47 2	7.7	54.9	5,639	25	110
3	Rural (Benton's)	33.3	6.8	40.1	7,878	30	115
4	Parrish	24.1	7.9	32.0	9,353	Oct 5	120
5	Wright's Golden	86.5	3.6	90.1	7,440	Sept. 15	100
6	Chester Co. Mammoth	50.6	12.4	63.0	8,744	30	115
7	Premium Dent	63.8	3.4	67.2	5,320	21	106
8	Sibley's Pride of the North	60.4	2.5	62.9	4,126	11	96
9	North Star	64.1	0.0	64.1	3,486	15	100
10	Blount's Prolific	46.1	18.8	64.9	10,409	25	110
11	Waushakum	31.4	0.0	31.4	2,889	4	89
12	Early Yellow Dutton	41.8	0.0	41.8	2,338	7	92
13	Chadwick	22.8	0.0	22.8	1,856	12	97
14	Silver Houghton Farm	34.1	4.7	38.8	2,201	12	97
15	Long Flint	55.0	0.0	55.0	4,719	15	100
16	King Philip	26.8	0.0	26.8	1,804	1	86

To discriminate accurately between soft and sound corn is a matter of considerable difficulty. This is especially so when several varieties are to be graded, as the appearance of ears of different varieties is somewhat variable. The points on which judgment was based, were appearance and feeling, and the test was applied with as much exactness as possible. The Dents, with but one exception, show soft corn. The late maturing varieties, as would be expected, giving the greater per cent.

The Flints, with but one exception, show no soft corn. A portion of the seed planted in one plot was washed out by a heavy rain before it came through the ground. This was replanted contrary to the original intention, and doubtless accounts for the soft corn of this plot. Newton was also replanted, as the first planting did not germinate at all. The seed was taken from a choice ear grown two years before and apparently had lost its vitality. These are the only instances in which foreign causes interfered with the perfect germination and development of several plots.

Table II repeats the total yield and gives certain other facts illustrating the individual merits of the several varieties :

TABLE II.

	Varieties.	Total bushels corn, 70 pounds each.	Weight of stalks.	Weight of stalks to 100 pounds of corn.	Weight of corn to one stalk.
			Pounds.	*Pounds.*	*Dec'm^s of a lb.*
1	Leaming	82.3	7,878	136.8	.53
2	Newton	54.9	5,639	146.8	.36
3	Rural (Benton's)	40.1	7,878	280.7	.37
4	Parrish	32.0	9,353	417.5	.20
5	Wright's Golden	90.1	7,440	117.9	.57
6	Chester County Mammoth	63.0	8,744	198.3	.50
7	Premium Dent	67.2	5,320	113.1	.44
8	Sibley's Pride of the North	62.9	4,126	93.7	.44
9	North Star	64.1	3,486	77.7	.40
10	Blount's Prolific	64.9	10,409	229.1	.41
11	Waushakum	31.4	2,889	131.4	.20
12	Early Yellow Dutton	41.8	2,338	79.9	.28
13	Chadwick	22.8	1,856	116.3	.16
14	Silver Houghton Farm	38:8	2,201	81.0	.25
15	Long Flint	55.0	4,719	122.6	.37
16	King Philip	26.8	1,804	96.2	.18

Careful attention is invited to this table. The total yield per acre is of first importance, as it, in a great measure, answers the question whether or not a variety is profitable. There are other points, however, which must not be overlooked, such as time of ripening, weight of corn in proportion to weight of stalks, and weight of corn to the single stalk.

In the above table Parrish shows itself to be almost worthless, as it yielded but one pound of corn for every 4.17 pounds of stalks; Rural shows next highest yield of stalks to the amount of corn, and Blount's Prolific follows next in order.

The lowest percentage of stalks to corn is shown by North Star, a yellow Dent variety, which shows a yield of one pound of corn to a little more than seven-tenths of a pound of stalks, or as expressed in the table, 100 pounds of corn for every 77.7 pounds of stalks. Of the Flints, Silver Houghton Farm shows 100 pounds of corn for each 81 pounds of stalks.

Considering all points as exhibited in Tables I and II, Wright's Golden shows the best record. Its total yield surpasses all others. The yield of soft corn is very low; it matures early, and it shows the greatest yield for each stalk. Its only weak point is that it gave one and one-sixth pounds of stalks for one pound of corn. Leaming shows the next best record. Rural, Parrish, and Blount's Prolific are splendid varieties for fodder corn, but on account of low yields and lateness of maturity, could not be regarded as profitable varieties to cultivate for the grain in this soil and climate.

A good variety of corn should produce nearly if not quite as much weight of corn in the ear as of stalks.

Table III exhibits some important facts in regard to size and weight of ears and cobs, and also the loss or gain by selling on the cob. The length of ear here given is the average of the variety as grown here this season. The average length of the sixteen varieties is but little over seven inches.

The average number of rows and kernels was determined by examining a large number of specimens of each variety.

The average diameters were taken at the middle, and in all cases measured to the sixteenth part of an inch.

The average weights were made to the eighth part of an ounce.

TABLE III.

Number of plot.	Variety.	Average length of ears.	Average number of rows.	Average number kernels in row.	Average number of kernels on ear.	Average diameter of ear.	Average diameter of cob.	Weight of average ear.	Weight of corn on average ear.	Weight of average cob.	Number of ears in a bushel, on the cob.	Number of ears in a bushel, shelled.
		Inches.				*Inches.*	*Inches.*	*Oz.*	*Oz.*	*Oz.*		
1	Leaming	8.1	22	44	950	2¼	1⅜	9¼	7½	1¾	121	119
2	Newton	6.3	18	40	720	2	1¼	8½	7¼	1¼	130	124
3	Rural (Benton's)	7.6	16	40	640	2 5–16	1½	9	6½	2½	124	134
4	Parrish	5.7	16	38	500	1⅞	1 7–16	*	*	*	*	*
5	Wright's Golden	6.8	12	45	540	1 11–16	15–16	7¼	6¼	1	154	143
6	Chester County Mammoth	6.8	18	44	800	2¼	1½	9¾	7½	2¼	115	119
7	Premium Dent	6.7	16	43	690	1⅞	1⅛	8⅜	6⅞	1½	134	130
8	Sibley's Pride of the North	6.7	16	45	720	1⅞	1 1–16	7½	6½	1	149	134
9	North Star	6.3	18	36	650	1⅞	1 1–16	7¼	6¼	1½	155	150
10	Blount's Prolific	6.2	10	35	350	1⅜	⅞	3	2⅜	⅝	373	379
11	Waushakum	7.0	8	45	350	1 7–16	15–16	4¼	3⅛	1⅛	264	287
12	Early Yellow Dutton	7.4	12	40	475	1⅝	⅞	5¾	4½	1¼	195	198
13	Chadwick	7.2	8	42	340	1¼	13–16	4	3¼	¾	250	276
14	Silver Houghton Farm	8.7	8	45	360	1½	15–16	5¾	4⅝	1⅛	195	194
15	Long Flint	8.4	8	48	380	1½	15–16	6	4¾	1¼	187	189
16	King Philip	6.8	8	40	325	1⅜	¾	4¼	3⅝	⅝	264	247

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* This variety, though put away exactly like the others, had become so much decayed that weights could not be made with accuracy.

The relative number of ears required to make a bushel, whether shelled or unshelled, is quite an important point and deserves careful attention.

For instance, the average ear of Leaming weighs nine and one-fourth ounces, and counting at that rate, it would require 121 ears to make a bushel of corn (seventy pounds); but this ear will yield seven and one-half ounces of shelled corn, and by a calculation similar to the first, we ascertain that it only requires 119 ears to make a bushel of shelled corn (fifty-six pounds.) (Fractions of an ear are not given in this calculation.)

Tracing down these two columns, we see that in most instances the ordinary method of selling corn in the ear at seventy pounds per bushel is advantageous to the buyer.

The most notable exception to this rule is the Rural, which requires ten more ears to shell a bushel than would make a bushel by weight in the ear.

The following table gives the per cent. of kernels which germinated, also the per cent. of perfect stand which was harvested, and the corrected yield of corn and stalks:

TABLE IV.

	Variety.	Per cent. which germinated.	Per cent. of perfect stand.	Corrected yield of corn.	Corrected yield of stalks.
				Bushels.	*Pounds.*
1	Leaming	100.0	97.4	84.5	8,088
2	Newton	*	95.7	57.4	5,892
3	Rural (Benton's)	64.5	70.0	57.2	12,683
4	Parrish	96.0	98.2	32.6	9,524
5	Wright's Golden	99.0	98.7	91.3	7,538
6	Chester County Mammoth	60.0	78.4	80.4	11,153
7	Premium Dent	93.0	97.0	69.3	5,484
8	Sibley's Pride of the North	91.0	90.8	69.3	4,544
9	North Star	100.0	100.0	†	†
10	Blount's Prolific	98.5	98.8	65.7	10,535
11	Waushakum	94.5	97.5	32.2	2,963
12	Early Yellow Dutton	100.0	92.7	45.0	2,522
13	Chadwick	65.0	90.0	25.3	2,062
14	Silver Houghton Farm	86.0	97.0	40.0	2,271
15	Long Flint	96.0	92.6	59.4	5,096
16	King Philip	93.0	92.0	29.1	1,961

* As is stated elsewhere, this variety did not come, and was re-planted.

† This variety germinated perfectly and also was a perfect stand at harvest-time, hence it has no corrected yield.

The above table gives a better comparison of the several varieties than is obtained in Table I.

The yields here given of corn and stalks are such as might be expected under perfect conditions of germination and a perfect stand at harvest-time. The first two columns, which give the per cent. which germinated and the per cent. of perfect stand at harvest, must not be confounded, as they bear no relation to each other. The first column was obtained in this manner: As soon as the plants were all through the ground they were carefully counted, and knowing the number of hills in each plat, and the number of kernels planted in each hill, it was very easy to determine the per cent. which germinated. The vitality of the several varieties, as shown by this column, is nothing conclusive as to what their vitality might be under different circumstances, for the seed was collected from different localities and could not be expected to show that uniformity which would doubtless be shown by seed grown, ripened, and preserved under the same conditions.

The second column shows the per cent. of stalks that were standing at maturity, and this was obtained by actual count. Considering the yields given in Table I as such a percentage of a perfect yield, the yields given in this table were obtained. Then, as before stated, these corrected yields are what might be expected of the several varieties under more perfect conditions.

Tables I and IV will bear careful comparison.

Table V brings out the most important points of the previous tables.

TABLE V.

	Variety.	Total yield as weighed from the field.	Total yield as corrected to a perfect stand.	Pounds of stalks to 100 pounds of corn.	Weight of corn for each stalk.	Weight of corn shelled from 70 pounds of ears.	
		Bu.—70 lbs. each.	*Bu.—70 lbs. each.*	*Pounds.*	*Decimals of a pound.*	*Lbs.*	*Oz.*
1	Leaming	82.3	84.5	136.8	.53	56	12
2	Newton	54.9	57.4	146.8	.36	58	14
3	Rural (Benton's)	40.1	57.2	280.7	.37	50	6
4	Parrish	32.0	32.6	417.5	.20	*	
5	Wright's Golden	90.1	91.3	117.9	.57	60	2
6	Chester County Mammoth	63.0	80.4	198.3	.50	53	14
7	Premium Dent	67.2	69.3	113.1	.44	57	11
8	Sibley's Pride of the North	62.9	69.3	93.7	.44	60	8
9	North Star	64.1	64.1	77.7	.40	55	12
10	Blount's Prolific	64.9	65.7	229.1	.41	55	7
11	Waushakum	31.4	32.2	131.4	.20	51	9
12	Early Yellow Dutton	41.8	45.0	79.9	.28	54	14
13	Chadwick	22.8	25.3	116.3	.16	56	14
14	Silver Houghton Farm	38.8	40.0	81.0	.25	56	5
15	Long Flint	55.0	59.4	122.6	.37	55	9
16	King Philip	26.8	29.1	96.2	.18	59	13

* This variety had begun to decay and hence could not be accurately weighed.

CROSSING VARIETIES OF CORN.

The work begun in 1882 was continued and some new crosses were made the past season. Inasmuch as there is a great diversity of opinion regarding the effect of cross fertilization, a somewhat detailed account of this work is here given.

Effort was made to secure varieties of a well fixed and as nearly perfect type as could be selected. Such as had desirable qualities distinctly marked and that appeared to be adapted to our climate, were generally chosen. For experimental purposes, however, some crosses were made without reference to selection for improvement.

In the following description the name of the male parent, or the one furnishing the pollen, will always be given first and the name of the female parent, or the one bearing the ear, will be given last. To illustrate: "Flint on Dent" means that the pistillate flowers (silks) of the Dent corn were fertilized by the pollen from the staminate flowers (tassels) of the Flint corn.

The plots in all cases were one rod in length, three rows, three and one-half feet apart. The variety on which the cross was to be made was planted in the center row, and the tassels destroyed before they came out of the last leaf. The corn from this center row was taken as the product of the first cross, and planted to ascertain what effect the cross would have upon the succeeding crop. These plots were planted as far from each other or other corn as possible, to prevent inter-crossing.

Owing to a severe and long protracted summer drouth, the development of the corn was not what we had hoped. In most cases the ears were small.

FLINT ON DENT (CROSS OF '82.)

From this cross several fairly well developed ears were secured, which, with but slight exception were true to the female type. The only exceptions noted were that in some of the poorer ears, a very few of the kernels took on the Flint characteristics of form, and that some of the kernels, while retaining the Dent form, lost the yellow color of the original ear, showing the white color of the Flint. The effect of the cross was so little apparent, however, that a person not knowing the facts would not suspect that it had been made.

The crop of corn grown from the above cross the past year, shows no exact resemblance to either parent, but takes some of the characteristics of both. The rows are very uniform and straight, a characteristic of the Flint. The kernels are all dented, but instead of being rectangular in shape, like the Dent parent, are of medium width and flat. The ears show about an even admixture of white and yellow kernels, are close and compact with a small cob. The two colors will be sorted and planted the present season.

DENT ON FLINT (CROSS OF '82.)

This cross and all others hereafter mentioned were made the same as the one described, hence this and those following will be noticed more briefly.

The product of this cross for the first year was slightly marked by influence of male parent, the Dent.

For the second year (1883) the product bears but little resemblance to the Flint parent; the kernels are nearly all dented, only occasionally one being filled up full at the points like the Flint. The rows resemble Dent corn in appearance much more than Flint. The kernels are about evenly divided between light and yellow. Though described somewhat as the result of the previous mentioned cross, it looks but little like it, lacking the regularity of rows and also the wide, flat kernels.

Corn from the same ears was used for both plots, the cross being just reversed.

FLINT ON SWEET (CROSS OF '82.)

This cross was quite successfully accomplished and some well developed ears were secured. The Flint variety seemed to exercise a very strong influence on the product the first year.

The rows, shape of ear and arrangement of kernels was that of the female parent, but the kernels were, with but few exceptions, filled up full at the points like Flint.

This corn was planted like previous crosses, in a plot by itself, in the spring of '83. The product is about two thirds white and yellow Flint kernels and one-third Sweet corn kernels. The arrangement of rows and kernels is more that of the Flint than the Sweet corn.

SWEET ON FLINT (CROSS OF '82.)

This cross was also successfully accomplished and some fair specimens secured. The ears, with one exception, showed the influence of the male parent. This one was perfectly Flint in appearance. In the others most of the kernels were slightly dented, but showed no resemblance to the Sweet corn kernel. The product of this cross for '83 shows about one fifth Sweet corn kernels and four-fifths Flint kernels. The latter are mostly light colored, but some are yellow.

The arrangement of rows and kernels on some ears resembled Sweet corn, and on others Flint.

CROSSES OF '83.—DENT ON DENT.

No. 1, *Newton on Leaming.*—This was a cross of a very deep kerneled corn on one which, while having very good characteristics as a variety, had too large a development of cob. Both were yellow Dents and the product of the cross for this year resembles the female parent.

No. 2.—This was the reverse of the above, with the same general results.

No. 3, *Wetherell on Leaming.*—Was a cross very similar to the above and with like results.

No. 4, *Leaming on Wetherell.*—This was the reverse of No. 3, and though both parents were yellow Dents of quite well established types, the product shows many kernels streaked with red and a few entirely red kernels. To our certain knowledge there was no red corn grown anywhere near these plots. In size and shape the ears resemble those of the female parent.

No. 5, *Newton on Big Dent.*—This was a cross of two yellow Dent varieties. The male parent was the same deep kerneled corn used in No. 1, while the female parent was a large, many rowed variety. The product resembles the female parent in size and in number of rows. The kernels have not the regular rectangular appearance of this parent, being rather irregular in shape and having somewhat elongated hulls like the hackberry.

No. 6.—Was the above cross reversed; the product very nearly resembling the female parent.

THICK AND THIN PLANTING.

This test was conducted very much the same as in 1882, except that the number of plots was increased, and the distances were somewhat varied.

The plots devoted to this work, eighteen in number, occupied a continuous piece of ground of very uniform character, the soil being a rather stiff clay loam.

An accurate idea may be formed of the situation of the plots by reference to the following plan, Diagram B. The size of plots was exactly one-sixteenth of an acre each.

DIAGARAM B, SHOWING PLOTS IN THICK AND THIN PLANTING.

Center road.

286. 1 kernel 6 inches.

288. 1 kernel 9 inches.

290. 1 kernel 12 inches.

292. 1 kernel 15 inches.

294. 1 kernel 18 inches.

296. 1 kernel 21 inches.

298. 1 kernel 24 inches.

300. 2 kernels 12 inches.

302. 2 kernels 15 inches.

304. 2 kernels 18 inches.

306. 2 kernels 21 inches.

308. 2 kernels 24 inches.

310. 2 kernels 27 inches.

312. 2 kernels 30 inches.

314. 3 kernels 18 inches.

316. 3 kernels 24 inches.

318. 3 kernels 30 inches.

320. 3 kernels 36 inches.

There was a break in the planting of a few days occasioned by rain, but so far as could be seen it did not effect the experiment.

The first planting was done May 26, and the plots were finished the 29th. The field notes on these plots contain the following entries: "June 4, first planting is through," "June 5, second planting is through, and notwithstanding heavy rains and bad weather generally, there is a good stand, and the corn looks well." The cultivation of these plots was very carefully attended to, and all cultivated at the same time and in the same manner. The soil was kept mellow and free from weeds.

As remarked last year, the growth of the closely planted plots was more rapid during the early part of the season than those planted at greater distances. This difference of growth is very noticeable for the first few weeks, but gradually the difference becomes less, until at maturity the advantage is decidedly in favor of the greater distances. It was interesting to watch the development of the several plots under these conditions. During the drouth, which began in the latter part of July and continued throughout August, the stalks of the thick planting became weak, some of them actually falling over to the ground. While the thinner planting, though it suffered from the same cause, was not so much affected by it.

The following tables give a complete series of the several plots. Table I gives the actual yields of corn and stalks as weighed when husked, and table II gives the yields corrected to a perfect stand. The method of getting this corrected yield was explained under "test of varieties," and it is deemed of especial importance in this work, as it shows as accurately as it is possible what might be expected from a perfect stand at the several distances as given in the table.

TABLE I.—ACTUAL YIELDS PER ACRE AS WEIGHED FROM THE FIELD.

	How planted.	Bushels sound corn, 70 pounds.	Bushels soft corn, 70 pounds.	Total bushels corn, 70 pounds.	Weight of stalks.
1	1 kernel 6 inches	55.0	5.8	60.8	10,208
2	1 " 9 "	86.6	2.3	88.9	7,360
3	1 " 12 "	85.3	0.7	86.0	7,104
4	1 " 15 "	80.0	0.9	80.9	6,368
5	1 " 18 "	71.6	0.0	71.6	5,088
6	1 " 21 "	67.0	0.0	67.0	4,800
7	1 " 24 "	72.9	0.0	72.9	5,184
8	2 kernels 12 "	77.5	5.5	83.0	7,744
9	2 " 15 "	87.8	4.3	92.1	6,528
10	2 " 18 "	84.8	2.3	87.1	7,008
11	2 " 21 "	77.3	1.4	78.7	5,728
12	2 " 24 "	78.0	1.4	79.4	5,184
13	2 " 27 "	66.8	0.7	67.5	4,480
14	2 " 30 "	76.6	0.0	76.6	5,024
15	3 " 18 "	59.7	3.4	63.1	7,104
16	3 " 24 "	59.9	0.0	59.9	5,760
17	3 " 30 "	62.9	0.5	63.4	5,024
18	3 " 36 "	76.1	0.5	76.6	5,024

These plots were marked "ripe" September 21, and as will be seen from the above table a very high percentage of all the corn was well ripened; some plots show no soft corn at all. The grading of the corn in regard to soundness is of necessity a somewhat arbitrary matter, but it was as fairly done as possible. While the percentage of sound corn is high, the per cent. of large, well matured ears falls very low in some of the plots, as will be seen from table V.

The highest yield is shown by plot 9, 2 kernels 15 inches; this plot has but a very few less stalks per acre than 1 kernel 6 inches, but the greater distance between the hills seems to allow of better development.

By further comparison of plots 1 and 9, in table III, it will be seen that of the total product of the latter, 34.3 per cent. were rated as ears, while only 6.37 per cent. of the former were rated as such.

TABLE II.—CORRECTED YIELDS.

	How planted.	Bushels sound corn.	Bushels soft corn.	Total bushels corn.	Weight of stalks, lbs.	Per cent. of perfect stand.
1	1 kernel 6 inches	57.3	6.0	63.3	10,619	96.1
2	1 " 9 "	104.1	2.8	106.9	8,848	83.2
3	1 " 12 "	100.4	0.8	101.2	8,358	85.0
4	1 " 15 "	96.7	1.1	97.8	7,700	82.7
5	1 " 18 "	92.4	0.0	92.4	6,560	77.5
6	1 " 21 "	85.9	0.0	85.9	6,154	78.0
7	1 " 24 "	75.2	0.0	75.2	5,344	97.0
8	2 kernels 12 "	82.3	5.8	88.1	8,221	94.2
9	2 " 15 "	108.9	5.3	114.2	8,099	80.6
10	2 " 18 "	96.4	2.6	99.0	7,964	88.0
11	2 " 21 "	84.3	1.5	85.8	6,246	91.7
12	2 " 24 "	87.1	1.6	88.7	5,790	80.5
13	2 " 27 "	74.5	0.8	75.3	4,994	89.7
14	2 " 30 "	83.8	0.0	83.8	5,494	91.4
15	3 " 18 "	66.8	3.8	70.6	7,943	89.4
16	3 " 24 "	69.7	0.0	69.7	6,698	86.0
17	3 " 30 "	72.2	0.6	72.8	5,768	87.1
18	3 " 36 "	89.4	0.6	90.0	5,904	85.1

The above table is in arrangement of columns exactly like table I, with the addition of one more column, which gives the per cent. of perfect stand, and is the basis on which this corrected yield was obtained. This column, which gives the per cent. of perfect stand, is given here to make more plain, if possible, what we mean by corrected yield. It shows the exact per cent. of a perfect stand which was harvested and was obtained by making an actual count of the stalks standing before cutting the corn.

For example, plot 1 had 3.9 per cent. missing, this left 96.1 per cent. of a perfect stand; now, considering the total yield, 60.8 bushels, as given in table I, to be, instead of the true yield, 96.1 per cent. of the true yield, we obtain the corrected yield, which is 63.3 bushels. In this instance the correction is but slight, amounting to but 2.5 bushels; but in some plots, from several causes, among which we might mention as most active, failure to germinate and destruction of occasional hills by crows, ground squirrels, etc., the per cent. missing is much greater. Plot 5, for instance, shows 22.5 per cent. missing, or only 77.5 per cent. of a perfect stand; here the correction becomes very important, amounting to 20.8 bushels. It will he seen from this that a much more intelligent comparison between the yields of corn and stalks at the different distances is obtained by this corrected table.

It would be much more satisfactory if a perfect stand could be obtained from which no correction would be necessary. This, however, is nearly impossible when such large plots (1-16 acre each) are used. A person merely giving our plots a casual examination would say, "How perfect the stand," but act count revealed the fact that a perfect stand had not been obtained, though great care was exercised.

By comparing Tables I and II, when one kernel was used, it will be noticed that both give the highest yield at nine inches apart, and from that there is a gradual decrease in yield to the greatest distance. With this decrease in yield there is a very marked improvement in the quality, which will be more clearly brought out in a subsequent table. For comparison, the plot showing the highest yield is selected from each of the three divisions of these two tables, and here arranged so as to bring out clearly some interesting points.

TABLE III.

	How planted.	Total bushels corn per acre as taken from field.	Total bushels corn per acre as corrected to perfect stand.	Weight of stalks per acre as taken from the field.	Weight of stalks per acre as corrected to perfect stand.	Total number of stalks per acre, perfect stand.	Weight of corn for one stalk.	Per cent. of ears.	Per cent. of nubs.
2	1 kernel, 9 inches........	88.9	106.9	7,360	8,848	16,942	.44	33.77	66.23
9	2 kernels, 15 "	92.1	114.2	6,528	8,099	25,409	.31	34.30	65.7
18	3 kernels, 36 "	76.6	90.0	5,024	5,904	14,834	.42	68.30	31.7

The highest yield of corn is shown both in the actual and corrected yields by plot 9, (2 kernels, 15 inches); but tracing this plot through the table it will be seen that it had nearly nine thousand more stalks than plot 2, and more than ten thousand more than plot 18, which fact reduces the production to the individual stalk very much. This is an important matter, since as the production to the stalk decreases the per cent. of what is called nubs increases. In other words, it is necessary to secure the highest possible production to the stalk if we wish to secure the most perfect types of ears and thus improve the variety.

The above remarks are true, as a general rule; but in plot 9 which does show a less production to the stalk than plot 2, we have a slightly greater per cent. of ears. This must be accounted for by the fact, that while this plot contained a great many more stalks than plot 2, the hills were at greater distances apart. From actual count made plot 9 had a great many more barren stalks than plot 2, which fact is shown by the decreased production of corn to the stalk.

Plot 18 has two thousand less stalks than plot 2, and its yield to the stalk is a very little less; but these two points decrease the corrected yield 16.9 bushels, and the actual yield as weighed from the plots, 15.5 bushels.

For further illustration and comparison, one plot is taken from each division of tables I and II, having just the same number of stalks, but planted at different distances, and arranged in the following table:

TABLE IV.

	How planted.	Total bushels per acre as taken from field.	Total bushels per acre corrected to perfect stand.	Weight of stalks as taken from the field.	Corrected weight of stalks.	Weight of corn to each stalk.	Per cent. of ears.	Per cent. of nubs.
1	1 kernel, 6 inches...	60.8	63.3	10,208	10,619	.17	6.37	93.63
	2 kernels, 12 "	83.0	88.1	7,744	8,221	.24	17.70	82.30
	3 kernels, 18 "	63.1	70.6	7,104	7,943	.19	14.20	85.80

Exactly the same quantity of seed under exactly the same conditions would, eoretically, produce like results. Here we have the first condition—like uantities of seed per acre—but further than that the three plots under considerion do not agree. In the first place the seed is differently distributed, which s, no doubt, a factor of some importance in the results. Some allowance must also be made for the ever varying character of soil, which is a serious element of error in all field experiments.

That these are improper distances for planting corn, one would have no difficulty in determining, after noting the low yield per stalk and the very low per cent. of ears. It is quite evident from the table that where so much seed is used per acre, grouping the kernels together is better than otherwise, as it secures better development of the ear.

Table V, brings out the important points as to development of ears at the different distances and corn to the amount of stalks:

TABLE V.

	How planted.	Total yield per acre as taken from the field.	Total yield as corrected.	Per cent. of ears.	Per cent. of nubs.	Weight of corn for each stalk.	Weight of stalks to 100 pounds of corn.
		Bushels.	*Bushels.*			*Lbs.*	*Lbs.*
1	1 kernel, 6 inches	60.8	63.3	6.4	93.6	.17	240
2	1 " 9 "	88.9	106.9	33.8	66.2	.44	118
3	1 " 12 "	86.0	101.2	50.4	49.6	.54	118
4	1 " 15 "	80.9	97.8	61.1	38.9	.64	112
5	1 " 18 "	71.6	92.4	70.0	30.0	.73	101
6	1 " 21 "	67.0	85.9	73.1	26.9	.78	102
7	1 " 24 "	72.9	75.2	76.6	23.4	.81	101
8	2 kernels, 12 "	83.0	88.1	17.7	82.3	.24	133
9	2 " 15 "	92.1	114.2	34.3	65.7	.31	101
10	2 " 18 "	87.1	99.0	40.8	59.2	.35	115
11	2 " 21 "	78.7	85.8	45.2	54.8	.37	104
12	2 " 24 "	79.4	88.7	55.2	44.8	.43	93
13	2 " 27 "	67.5	75.3	58.8	41.2	.41	95
14	2 " 30 "	76.6	83.8	66.6	33.4	.52	94
15	3 " 18 "	63.1	70.6	14.2	85.8	.19	161
16	3 " 24 "	59.9	69.7	29.3	70.7	.22	137
17	3 " 30 "	63.4	72.8	57.2	42.8	.29	113
18	3 " 36 "	76.6	90.0	68.3	31.7	.42	94

Both the actual and corrected yields are given in the above table so that the comparison may be easily obtained. The per cent. of ears and nubs was obtained by actual count, and though this division is an arbitrary one, it was done with great care, even so far as to make exact measurements in all doubtful cases.

To get these percentages accurate, necessitated a great deal of careful work but as the development of the ear was one of the main points of inquiry in this test, no pains were spared to gather from the plots all the data possible.

Plot 7, (1 kernel, 24 inches), shows the greatest per cent. of ears, being a little more than three-fourths of the entire number, leaving less than one-fourth for nubs. Considering the high standard at which the product was graded, this is a most excellent showing. The total number of ears and nubs on this plot exceeded the total number of stalks by a small percentage.

This same plot also shows the highest production to the single stalk, being .81 of a pound. This plot certainly shows a remarkable yield, when it is remembered that it only contained one-fourth the stalks of plot one, a little more than one-fourth as many as plots two and nine, and but one-half as many as plot eighteen. It shows a total yield of 72.9 bushels or corrected yield of 75.2 bushels per acre.

This indicates something near what our farmers should accomplish with good seed and good cultivation. The maximum yield is obtained in plot nine but as already stated, this did not yield corn of a desirable quality.

Many interesting comparisons might be made, but the reader can make them for himself, and deduce his own conclusions therefrom.

PLANTING AT DIFFERENT DEPTHS.

This work was done with care, varying the time of planting so as to observe the effects of moisture and temperature as far as possible on the germination and growth of corn at the different depths. Attention is called to the accompanying plan of the plots.

As it is very difficult to plant plots at different depths with as great accuracy as is necessary for experiment work, the size was reduced by cutting the ordinary experiment plot (one-sixteenth of acre) into six rectangular plots with aisles four feet wide between them.

DIAGRAM PLAN OF PLOTS.

Planted May 21, '83. Ripened Sept. 15, 1833.	285 F. 6 inches.	285 E. 5 inches.	285 D. 4 inches.	285 C. 3 inches.	285 B. 2 inches.	285 A. 1 inch.
Planted June 2, '83. Ripened Sept. 21, 1883.	287 F. 6 inches.	287 E. 5 inches.	287 D. 4 inches.	287 C. 3 inches.	287 B. 2 inches.	287 A. 1 inch.
Planted June 9, '83. Ripened Sept. 30, 1883.	289 F. 6 inches.	289 E. 5 inches.	289 D. 4 inches.	289 C. 3 inches.	289 B. 2 inches.	289 A. 1 inch.

The distance between rows was the same in this work as that previously given, three and one-half feet, and the distance in the row was uniformly three feet. The corn was dropped in a furrow of sufficient depth to make the hill when covered on a level with the surface.

TABLE I.—YIELD OF CORN AS WEIGHED FROM FIELD.

	Depth of planting.	May 26, 1883.			June 2, 1883.			June 9, 1883.		
		Bushel sound corn, 70 pounds each.	Bushels soft corn, 70 pounds each.	Total bushels corn, 70 pounds each.	Bushels sound corn, 70 pounds each.	Bushel soft corn, 70 pounds each.	Total bushels corn, 70 pounds each.	Bushels sound corn, 70 pounds each.	Bushels soft corn, 70 pounds each.	Total bushels corn, 70 pounds each.
1	1 inch deep...	94.3	0.0	**94.3**	92.4	0.0	**92.4**	59.7	3.9	**63.6**
2	2 inches deep	52.6	0.0	**52.6**	61.8	0.0	**61.8**	53.5	9.1	**62.6**
3	3 " ..	53.6	0.0	**53.6**	40.6	2.5	**43.1**	41.1	7.2	**48.3**
4	4 " ..	50.3	0.0	**50.3**	59.1	6.7	**65.8**	35.7	7.6	**43.3**
5	5 " ..	43.5	0.0	**43.5**	50.0	4.5	**54.5**	36.9	9.9	**46.8**
6	6 " ..	57.9	0.0	**57.9**	63.9	3.8	**67.7**	27.7	7.7	**35.4**

TABLE II.—WEIGHT OF STALKS, ETC.

	Depth of planting.	May 26, 1883.			June 2, 1883.			June 9, 1883.		
		Weight of stalks.	Average weight of corn for 1 stalk.	Weight of stalks for 100 ℔. of corn.	Weight of stalks.	Average weight of corn for 1 stalk.	Weight of stalks for 100 ℔. of corn.	Weight of stalks.	Average weight of corn for 1 stalk.	Weight of stalks for 100 ℔. of corn.
1	1 inch deep.....	5,912	.60	90	6,434	.48	100	5,934	.47	133
2	2 inches deep..	3,553	.48	96	4,776	.42	110	5,505	.45	125
3	3 " ..	3,421	.51	91	2,412	.54	80	3,649	.32	108
4	4 " ..	2,895	.51	82	5,253	.46	114	4,218	.31	141
5	5 " ..	2,500	.43	82	3,696	.39	97	3,980	.35	121
6	6 " ..	5,111	.42	125	4,310	.48	91	3,262	.27	132

Tables I and II give the main facts in regard to production of corn and stalks, and need but little comment.

It is very noticeable that the first series, planted May 26, shows no soft corn, and following the same series down through Table II, it also shows heavy weight of corn to the individual stalk, and light weight of stalks to the 100 pounds of corn.

The total yields of the first and second planting, one-inch plots, are very uniform, while the second falls considerably short of these two, and shows quite a percentage of soft corn. This decrease in yield is doubtless due to time of planting. Similar comparisons does not show this observation to be true in all cases.

The heaviest average yield is shown by the second planting, which gives 64.2 bushels as the average, while the first gives 58.7 bushels, and the last planting just 50 bushels, as the average yield per acre.

In a following table will be given the yields corrected to a perfect stand.

The real object of this test is not a comparison of the yield of one series with the others, but a comparison of the plots of each series with the other plots of the same series.

By this comparison in the first series, we see a decrease of 50.8 bushels from plot 1 to plot 5. Plot 6 shows an increase, being but 36.2 bushels less than plot 1.

Table III brings out some important points in regard to the germination of the corn at the different depths, and the development of ears. It also gives the character of the weather, from time of planting until the corn was through.

TABLE III.

	Depth of planting.	Per cent. of grains planted that did not germinate.	Per cent. of ears.	Per cent. of nubs.	Notes showing state of weather from time of planting until all plots were through:
May 26, 1883.					MAY 26, 1883. The weather was clear and warm for several days previous to planting, but began to storm this P. M., and rainfall for next four days was 2.08 inches; then weather fair until June 6 and 7, when there was a rainfall of .55 of an inch. Shallow planting was through June 5, and deeper planting June 8. Mean temperature for period to June 8, 63.1° Fahrenheit. Entire period, 13 days.
1..........	1 inch deep......	3	62.3	37.7	
2..........	2 inches deep...	1¼	47.1	52.9	
3..........	3 " ...	7	59.4	40.6	
4..........	4 " ...	14½	66.7	33.3	
5..........	5 " ...	16	51.1	48.9	
6..........	6 " ...	22 2-5	62.5	37.5	
June 2, 1883.					JUNE 2, 1883. Weather was fair until June 6 and 7, when rain fell, as mentioned above. Shallow planting was through June 8, and deeper planting June 11. On the 10th and 11th, 1.65 inches of rain fell. Total for period, 2.20 inches. Mean temperature for period, 70.3° Fahrenheit. Entire period, 10 days.
1..........	1 inch deep......	4⅜	73.7	26.3	
2..........	2 inches deep...	5	63.7	36.3	
3..........	3 " ...	9	61.1	38.9	
4..........	4 " ...	11	58.1	41.9	
5..........	5 " ...	16⅜	54.4	45.6	
6..........	6 " ...	21½	60.3	39.7	
June 9, 1883.					JUNE 9, 1883. The weather was very stormy during this period, aside from rain on the 10th and 11th, as mentioned above; the fall for rest of period was 1.11 inches, making a total of 2.76 inches. Shallow planting was through on the 15th, deeper planting on the 18th. Mean temperature for period, 68.9° Fahrenheit. Entire period, 9 days.
1..........	1 inch deep......	*14	33.7	66.3	
2..........	2 inches deep...	0	38.1	61.9	
3..........	3 " ...	10½	26.7	73.3	
4..........	4 " ...	14	29.5	70.5	
5..........	5 " ...	17⅓	39.5	60.5	
6..........	6 " ...	21⅜	27.8	72.2	

* It is certain from the displacement of hills, that something interfered with this plot.

In the above table the per cent. which did not germinate was obtained by actual count. This should properly read per cent. which did not come through. There is a very marked similarity between the per cent. which did not come through in the last plot of each series.

The percentage of ears and nubs show some facts in regard to the development of the ears in the different plots.

The remarks on temperature and rainfall are made up from careful meterological observations made each day. It must be remembered that the different periods overlap each other so that rainfall in one period may appear as part of the rainfall of a subsequent period. The exact amount of precipitation from May 26 to June 18 was 5.39 inches, a very heavy rainfall, and had much to do with delaying the corn crop, and causing its failure over a large part of the State.

Table IV gives the total yield of each plot as weighed from the field, and also the yield of same corrected to a perfect stand. This correction has been explained, and is given here to show more clearly the differences between the actual yields of the several plots. The stalks missing at harvest are simply rated to produce the average amount per stalk, and this sum is added to the yield as weighed from the field.

TABLE IV.

No. of Plot.	Depth of planting.	May 26, 1883.			June 2, 1883.			June 9, 1883.		
		Per cent. of perfect stand.	Yield as weighed from field.	Corrected yield.	Per cent. of perfect stand.	Yield as weighed from field.	Corrected yield.	Per cent. of perfect stand.	Yield as weighed from field.	Corrected yield.
1	1 inch deep.....	100.0	94.3	**94.3**	100.0	92.4	**92.4**	88.0	63.3	**72.2**
2	2 inches deep..	99.2	52.6	**53.1**	95.4	61.8	**64.8**	97.0	62.6	**64.6**
3	3 inches deep..	95.7	53.6	**56.1**	95.7	43.1	**45.0**	95.0	48.3	**50.9**
4	4 inches deep..	89.7	50.3	**56.0**	95.4	65.8	**68.9**	89.0	43.3	**48.4**
5	5 inches deep..	91.5	43.5	**47.5**	93.5	54.5	**58.2**	86.2	46.8	**54.2**
6	6 inches deep..	88.9	57.9	**65.1**	92.9	67.7	**72.9**	84.3	35.4	**41.9**

The per cent. of perfect stand must not be confounded with or thought to bear any relation to per cent. which did come through. In each hill more corn was dropped than was required with the intention of thinning later in the season, if found necessary. It is upon the desired number of stalks in each hill that this per cent. is calculated, while the per cent. which did not come through is calculated upon the number of kernels placed in the ground.

No attempt is made to account for the irregularity in the decrease of yield from the one inch to the six inch plots; the facts are given and each reader may explain as best he can. In the meantime the Station will, by careful work and more thorough observation, endeavor to add new facts to those already obtained.

METHODS OF CULTURE.

A few tests were made to show the effects of different amounts, and different methods of culture upon the yield of corn. These tests were confined to eight plots of one sixteenth of an acre each. The soil is an undrained, heavy loam. The preparatory tillage was alike for all plots. The ground was well plowed and made mellow and friable with the harrow and roller. Plots No. 1 to No. 6, inclusive, were marked out and planted in the ordinary manner. Each plot being treated exactly alike.

After planting, plot No. 1, received no cultivation whatever. Plots No. 2 to 6 were gone over once with a common five-tooth cultivator, June 15. At this time the corn was from two to three inches high, and all the plots looked equally well. Plot No. 2 received no more culture of any kind. Plot No. 3 was cultivated again June 29; heavy rains prevented it being worked sooner. It received no further care.

Plot No. 4 was treated like No. 3, and cultivated again July 13th. This is all the culture it received. At the date of the last cultivation the corn was about four feet high.

Plot No. 5 was treated like No 4, and cultivated twice in addition; once upon July 31st, and again August 7th. The ground was very dry at this date, and the corn was just beginning to tassel out. It received no other culture.

Plot No. 6 was treated as follows: It was cultivated like No. 5, and carefully hoed twice. It received what might be called thorough culture.

The weeds, principally rag-weed, pig-weed, and wild buckwheat, made a large growth in No. 1; were nearly as large but less numerous in No. 2; and were not wholly killed in No. 3. Plot No. 4 could be called fairly clean. Plot No. 5 was perfectly so.

The soil of the plots cultivated more than once remained loose and mellow during the whole season. That of the plot not cultivated or cultivated but once, became very hard and compact.

The season was very wet up to the time of the third cultivation, after which it was equally dry.

Tests of ridge culture were made on plots Nos. 7 and 8.

The following table exhibits the general results of these tests:

Plot.	How cultivated.	Bushels sound corn, 70 pounds each.	Bushels soft corn, 70 pounds each.	Total bushels corn, 70 pounds each.	Weight of stalks.	Weight of stalks to 100 pounds of corn.
1	Neither cultivated nor hoed	9.8	11.9	21.7	3,008	198
2	Cultivated once	11.6	17.4	29.0	3,488	171
3	Cultivated twice	38.2	25.6	63.8	4,608	103
4	Cultivated three times	30.6	27.0	57.6	3,968	98
5	Cultivated five times	41.6	8.2	49.8	3,968	114
6	Cultivated and hoed thoroughly	32.7	5.0	37.7	3,648	138
7	Ridge culture, 12 inches apart	32.2	11.0	43.2	4,288	142
8	Ridge culture, 16 inches	35.2	6.9	42.1	3,968	135

The chief object in making these test was to find out something definite in regard to the limit of profitable cultivation of corn.

This limit appears to have been reached in plots three and four, which were cultivated but two and three times respectively. From these plots the total yield of corn was much greater than from the plots which received less, or from those which received more labor. Attention is called to the results shown by plots five and six.

The effects of the late cultivation is plainly seen. The total yield is much less than from plots three and four, but the percentage of sound corn is much greater. The late cultivation evidently checked the growth and hastened the maturity of the corn.

It must be borne in mind that the above figures are the results of a single year, and of a somewhat peculiar season.

The work in ridge culture was done with some implements donated to the Station by Mr. John W. Sohn, of Hamilton, Ohio.

The plots were plowed in the ordinary manner, the preparatory tillage being exactly the same as that of the first six plots.

Then instead of marking out, a ridge plow was used which threw up a ridge four to six inches in height.

These ridges were the same distance apart as the rows in the level cultivated plots.

Upon the ridge a one-horse corn drill was run, dropping and covering the corn with one movement.

These plots where planted June 7.

In the cultivation it was designed to use simply a ridge cultivator, adjusted by hinges. This consists of a beam or center piece to which wings are attached. It is provided in front with a small shovel, and in the rear with two harrow teeth. The whole is so arranged as to form an implement to stir the entire furrow between the rows by going once through.

Weeds are cut off by scrapers or blades, which can be set at different angles. These scrapers preserve the shape of the ridge, and restore or rebuild it wherever it is torn down.

Neither this cultivator nor the ridge plow worked satisfactorily in our soil, and further tests are necessary before their merits can be justly determined. The failure may be ascribed in part to lack of experience in the use of the implements.

The Station intends to give this system of cultivation a more extended and through trial this season.

APPLICATION OF FERTILIZERS TO CORN.

These experiments were conducted upon a series of forty plots, and includes in the list of articles tested as fertilizers nearly all ingredients commonly used for such purposes.

The plots were of the regular size one-sixteenth of an acre each and occupied a continuous piece of ground, excepting plots thirty-four to forty inclusive, which were on the north side of the road that extends through the center of the experiment grounds. The shape and arrangement of the plots may be clearly understood from the plan of wheat experiments given elsewhere in this report. The soil, a clay loam, varied somewhat in character, and for that reason, the series of plots will be divided into sections and treated separately. Section one will comprise plots one to twenty-two inclusive. Section two, plots twenty-three to thirty-three, and section three, plots thirty-four to forty.

The fertilizers used were as follows, viz.: (1.) *Purely mineral;* nitrate of soda, muriate of potash, sulphate of ammonia, gypsum, lime, and wood ashes. (2.) *Purely organic;* cow manure, horse manure, hog manure, hen manure, tobacco stems (ground) and bone meal. (3.) *Partly organic;* South Carolina Rock Phosphate, and superphosphate of lime.

Nitrate of soda, also called Chili Salt Peter, is valuable only for the nitrogen it contains. That used had a guaranteed analysis of 15 per cent. This mineral is quarried in Chili and Peru, South America, very extensively, and shipped to all parts of the world, and enters largely into all manufactured articles where a pure, cheap source of nitric acid and nitrates is required. It was used at the Station in the crude state, being first pulverized.

Muriate of Potash, also called Stassfurth Salts, is valuable for the potash it contains. That used at the Station was the crude salts, but of a high grade, showing 50 per cent. of potash. This mineral is quarried extensively near Stassfurth, Prussia. It enters largely into commerce, and is the great source of potash in most chemical manures.

Sulphate of ammonia is valuable for the nitrogen which it contains as ammonia. It is thought that this form of nitrogen is one of the most valuable as a fertilizer, being readily available as plant food. The sample used at the Station contained 25 per cent. of ammonia, equal to 20 per cent. of nitrogen. About 60 per cent. of this mineral is sulphuric acid, which may or may not be valuable according to the condition of the soil. This mineral is obtained from the ammoniacal vapors arising from city sewerage and from the liquor of gas works.

Gypsum, or land plaster, is sulphate of lime, and occurs in rocky deposits in many parts of the United States where it is quarried. After being crushed, or ground, it is ready for the market. The fertilizing ingredients are lime and sulphuric acid. The beneficial effects depend very largely upon the condition of the soil. It is largely used in the manufacture of superphosphate as a dryer.

Lime is a very valuable ingredient of the soil and comprises, of many plants, from one-third to more than two-fifths of the ash by weight. It is abundant in nearly all soils, and its value when applied as a fertilizer depends upon the amount of vegetable matter already in the soil from which it sets free nitrogen which would otherwise be unavailable. It is made by burning limestone, a mineral very abundant in most parts of the State.

Wood ashes vary much in composition according to the kind of wood from which they are produced. Their value depends chiefly on the potash they contain. There is also a very sensible quantity of phophoric acid in nearly all ashes, which is a valuable ingredient. The lime may or may not be valuable according to the conditions of the soil.

The mechanical effect of ashes upon the soil is also considered to be of much value. The best ashes are those from hard woods. Leached wood ashes contain a very small per cent. of fertilizing ingredients. Lime appears to form about one-fourth of the weight after leaching, but the potash has nearly disappeared.

The animal manures need no comments further than to say that they are valuable for the nitrogen, phosphoric acid and potash which they contain. They are also a source of humus in the soil, which is formed from decaying vegetable matter, and is thought in the light of recent investigations to be a most valuable agent of fertility in that it retains with great tenacity the ammonia formed in the soil.

Of tobacco stems, but little is known as to their value as a fertilizing agent. The ash is rich in potash. These stems accumulate with other waste and refuse parts of the leaf in cigar and other tobacco manufactures.

Bone meal is valuable for the phosphoric acid and nitrogen it con the raw bone in its crude state these agents are so locked up as to be unavailable to the plants until they are set free by the rotting or decomposition of the glue and other animal matter it contains. Bones are used in making high grade superphosphates, and in this condition the action upon the plant is very marked.

South Carolina Rock is obtained in immense quantities from districts around and near Charleston, S. C. It is the great source of phosphate of lime for the manufacture of chemical manures. These immense deposits consist chiefly of the remains and excreta of animals, and from the nature of the fossil remains are known to have been deposited on the bed of the ocean, many ages ago. The rock is mined very extensively for transporation to foriegn countries and home use. As a phosphate of lime, it is valuable for the phosphoric acid which it contains. In the crude state this is but slowly available for plant food.

Superphosphate of Lime.—While, as just stated, the phosphoric acid in South Carolina rock is but very slowly available for plant food, if to this same rock a certain amount of sulphuric acid or "oil of vitriol" be added, it so acts on the mineral as to render the greater portion of the phosphoric acid available at once. To this mixture the name of "superphosphate of lime," or simply "superphosphate," is applied. It enters largely into the composition of the various artificial manures, and is called by various names according as it is mixed with potash, with material containing nitrogen, or with both.

The different brands vary much in composition, and to protect the farmers from fraud many States oblige all firms exposing these goods for sale to pay a license fee and submit their goods for analysis at least once a year.

The sources of phosphoric acid are chiefly South Carolina rock or bones, the latter making the higher grade of manure. The chief sources of nitrogen are blood, tankage, slaughter house refuse, wool waste, fish scraps, leather, horns, hair, nitrate of soda, and sulphate of ammonia; of potash, the chief source is the muriate deposits near Stassfurth, Prussia, as before mentioned, but it is also easily obtained from wood ashes and a few other sources.

In buying articles under the name of superphosphate, parties should be careful to note the composition as given by the chemical analysis, and if no analysis can be furnished it would be well to let the fertilizer alone.

The fertilizers for section one, were all used separately in various amounts per acre and in combinations.

Table I gives the yields of corn and stalks for section one as weighed from the field.

TABLE I.

Plot.	How fertilized.	Bushels sound corn.	Bushels soft corn.	Total bushels corn per acre, 70 pounds each.	Weight of stalks.
1	Nitrate of soda, 300 pounds per acre in hill	57.4	3.2	60.6	4,448
2	Same, broadcast	60.4	2.7	63.1	4,320
3	Same, 600 pounds per acre broadcast	58.1	2.8	60.9	4,320
4	Muriate of potash, 300 pounds in hill	51.9	4.1	56.0	4,800
5	Same, broadcast	61.5	3.7	65.2	5,152
6	Same, 600 pounds per acre broadcast	59.0	4.6	63.6	5,856
7	South Carolina rock phosphate, 200 pounds per acre in hill	57.1	3.4	60.5	4,256
8	Same, broadcast	59.7	1.1	60.8	4,128
9	Same, 400 pounds per acre broadcast	63.1	0.3	63.4	4,864
10	Unfertilized	36.3	3.9	40.2	4,288
11	Sulphate of ammonia, 200 pounds per acre in hill	44.6	4.6	49.2	4,672
12	Same, broadcast	43.4	5.3	48.7	4,128
13	Same, 400 pounds per acre broadcast	35.7	3.0	38.7	3,424
14	South Carolina rock, 200 pounds, Nitrate of soda 300 pounds broadcast	49.1	5.2	54.3	3,584
15	South Carolina rock, 200 pounds, Muriate of potash, 300 pounds broadcast	67.0	2.5	69.5	4,928
16	Muriate of potash, 300 pounds, Nitrate of soda, 300 pounds broadcast	52.3	4.1	56.4	4,448
17	South Carolina rock, 200 pounds, Sulphate ammonia, 200 pounds, broadcast	59.4	3.4	62.8	4,384
18	South Carolina rock, 200 pounds, Sulphate of ammonia, 200 pounds, Muriate of potash, 300 pounds broadcast	70.2	2.1	72.3	5,664
19	Unfertilized	68.8	1.6	70.4	4,768
20	South Carolina rock, 200 pounds, Sulphate of ammonia, 200 pounds, Muriate of potash, 300 pounds, Nitrate of soda, 300 pounds broadcast	68.4	1.4	69.8	4,288
21	Same, one-half amount broadcast	70.6	1.1	76.7	3,968
22	Same, one-third amount broadcast	75.0	2.5	77.5	4,288

The soil for this section is mostly of a heavy clayey character, gradually shading off on the last few plots into that of section two, which is of a more loamy texture.

The yields of all the plots are quite uniform, regardless of fertilizers, except plots ten to thirteen which were situated on a portion of the field not so well drained as others, and plots eighteen to twenty-two in which the character of the soil was gradually changing into the loam of section two.

The first nine plots were planted May 29, when a storm interfered and made it necessary to defer planting until June 4, when all were finished.

The fertilizers were applied before planting, in the hill or broad-cast as stated in the table, and where the quantity was sufficient to make it necessary they were worked into the soil slightly before dropping the corn.

The corn came up very well, and with but few exceptions, as previously noted, made a good growth. The fertilizers had but very little, if any, effect on the growth during any of its stages or upon the yield.

The plots were all marked ripe September 21. The variety used was Leaming. The distance between the rows was three and a half feet, the same as all the corn work, and the hills were three feet apart, dropped by line.

Table II gives the corrected yield, percentage of kernels which did not germinate, percentage of perfect stand which was harvested, etc.

The method of obtaining these percentages has been previously explained.

The column showing fertilizers is not inserted in this table as reference can be easily made to table I.

TABLE II.

Plot.	Total bushels as weighed from field.	Total bushels as corrected to perfect stand.	Per cent. of perfect stand harvested.	Per cent. of kernels planted that did not germinate.	Weight of stalks to 100 pounds of corn.
1	60.6	69.4	88.8	17.0	105
2	63.1	68.0	93.0	14.5	98
3	60.9	66.7	91.2	17.3	113
4	56.0	67.1	83.4	24.0	122
5	65.2	68.4	95.2	9.3	113
6	63.6	67.9	93.6	13.5	131
7	60.5	66.1	91.5	16.0	100
8	60.8	65.3	93.1	15.6	97
9	63.4	66.7	92.3	16.6	109
10	40.2	41.3	97.3	7.3	152
11	49.2	52.6	93.5	10.4	135
12	40.7	50.7	96.0	10.5	121
13	38.7	42.8	90.3	20.0	127
14	54.3	58.3	93.0	12.5	94
15	69.5	75.0	92.6	14.0	101
16	56.4	62.8	89.6	17.5	113
17	62.8	63.5	97.3	8.0	100
18	72.3	73.5	98.1	5.5	112
19	70.4	72.1	97.6	5.6	97
20	69.8	72.3	96.6	11.0	89
21	71.7	73.7	97.2	6.6	79
22	77.5	79.2	97.8	5.5	78

The plots of section two occupied a more loamy piece of ground than section one as already mentioned, yet the two sections form one continuous series of plots. The soil in this section, as was said of the soil where varieties were planted, loses much of its clayey character, and is black and quite friable.

The date of planting these plots was June 5; other notes are just as for section one.

Table III gives the results as weighed from the field.

TABLE III.

Plot.	How fertilized.	Bushels sound corn.	Bushels soft corn.	Total bushels of corn per acre, 70 pounds each.	Weight of stalks.
23	Superphosphate of lime, 300 pounds in hill	92.6	0.0	92.6	5,600
24	Same, broadcast....................	85.7	0.0	85.7	5,216
25	Same, 600 pounds broadcast.....	91.2	0.0	91.2	5,088
26	Unfertilized	102.9	0.0	102.9	5,440
27	Gypsum, 500 pounds in hill.....	97.6	0.0	97.6	5,728
28	Same, broadcast	82.5	0.0	82.5	5,088
29	Same, 1,000 pounds, broadcast.	63.8	0.8	64.6	3,904
30	Lime, 50 bushels in hill..........	62.2	2.3	64.5	3,904
31	Same, broadcast	73.4	0.0	73.4	4,352
32	Wood ashes, 40 bushels in hill.	67.7	1.4	69.1	4,256
33	Same, broadcast	51.9	1.8	53.7	3,744

The superphosphate produced a very rank growth in the earlier part of the season, but the yield of corn is not equal to plot 26 unfertilized. No explanation of this can be given, as plot 26 had no apparant advantage of location, and the growth of the other plots appeared to be equally as good, and the three preceding plots better during the earlier part of the season.

Superphosphate, 600 pounds broadcast, did not produce as marked effect on the growing plant as 300 pounds in hill, and the yield is also a trifle less.

The difference of yield in plots treated with gypsum is entirely unexplained, as no natural cause can be assigned for it.

An ash tree of medium size stood immediately outside of the plots to the east, and doubtless affected No. 33 to considerable extent, but it is not probable that it affected other plots. The corrected yields are given in Table V, and it is important to notice that the same discrepancies in the yield appear in this, hence, it can not be argued that the stand was better on one plot than on the other, thus affecting the yield.

TABLE IV.

Plot.	Total bushels as weighed from the field.	Total bushels as corrected to perfect stand.	Per cent. of perfect stand harvested.	Per cent. of kernels planted that did not germinate.	Weight of stalks to 100 pounds of corn.
23	92.6	92.6	99.1	4.6	86
24	85.7	87.8	97.6	4.0	87
25	91.2	93.0	98.0	4.0	80
26	102.9	104.4	98.5	5.0	75
27	97.6	98.8	98.7	2.0	84
28	82.5	84.0	98.1	3.0	88
29	64.6	67.4	95.8	6.0	86
30	64.5	72.3	89.1	15.0	86
31	73.4	75.2	97.6	3.0	85
32	69.1	72.2	95.6	4.3	88
33	53.7	57.8	93.0	5.0	100

Attention is called to the extremely low average weight of stalks per hundred pounds of corn, showing that the production of ears was excellent for all plots in this section excepting number 33. The high per cent. which did not germinate in plot 30 is no doubt caused by the large quantity of lime used, though it was well mixed with the soil before dropping the seed. This is a matter of importance, as very often a crop is injured by placing too large a quantity of some strong fertilizing agent in immediate contact with the seed.

The relative comparison of yields is about the same with the corrected yields as without them, but this corrected yield entitles the results to much greater confidence as an imperfect stand at harvest would be a very fruitful source of error.

Section three of fertilizers were situated on the north side of center road as previously mentioned. The character of the soil was somewhat between that of the two previous sections, being a fair sample of clay loam. The fertilizers used were all organic, and all but two of them home production.

Table V gives the results as weighed from the field.

TABLE V.

Plot.	How fertilized.	Bushels sound corn.	Bushels soft corn.	Total bushels of corn per acre, 70 pounds each.	Weight of stalks.
34	Cow manure, 16 tons per acre...	55.3	4.8	60.1	4,704
35	Horse manure, 16 tons per acre..	69.0	5.0	74.0	5,344
36	Hog manure, 16 tons per acre..	66.7	4.6	71.3	5,344
37	Hen manure, 4 tons per acre...	43.2	4.1	47.3	3,872
38	Ground tobacco stems, 400 pounds per acre in hill.........	77.7	7.5	85.2	6,208
39	Bone meal, 400 pounds per acre in hill........................	64.9	6.9	71.8	5,984
40	Unfertilized................................	47.2	7.7	54.9	5,639

These plots were planted June 6.

The animal manures used were spread as carefully as possible over the surface of the ground, and the tobacco stems and bone meal were applied in the hill.

The variety of corn used was the Newton, a medium sized yellow dent sort which was thought to be excellent corn from its appearance when planted, bu it did very poorly in every instance except where well fertilized.

The much higher per cent. of soft corn where this variety is used is a strong point against it.

Omitting plots 34, 37, and 40 the yield is fairly good. On plot 34 the stand was good, but the lowness of yield is doubtless caused by the poor quality of the fertilizer; while on plot 34, 46.5 per cent. of the kernels planted never came through. This is thought to be due to the corn coming nearly in contact with the fertilizer. It was not thought necessary to work this fertilizer into the ground as it was well spread over the surface, but it apparently injured the crop. At harvest this plot showed 70.1 per cent. of a perfect stand, and this had made a poor growth. Plot 40 in all probability shows just about what the average product of this corn would have been without fertilizers.

As was remarked before but little is known of the value of tobacco refuse as a fertilizer, yet it appeared to have had a marked effect on this plot as it out-yields all others.

Table VI gives the corrected yields of section three, and the per cent. of germination, and of perfect stand at harvest.

TABLE VI.

Plot.	Total bushels as weighed from field.	Total bushels as corrected to perfect stand.	Per cent. of perfect stand harvested.	Per cent. of kernels planted that did not germinate.	Weight of stalks to 100 pounds of corn.
34	60.1	60.9	98.7	1.6	112
35	74.0	76.5	96.7	4.5	103
36	71.3	73.2	97.5	5.5	107
37	47.3	67.4	70.1	46.5	117
38	85.2	86.3	98.7	2.0	105
39	71.8	72.5	99.0	1.5	119
40	54.9	7.4	95.7	......	146

EXPERIMENTS WITH POTATOES.

The experiments in potato culture were conducted similar to those of last year, the work being considerably extended.

The tests were made under the following heads, viz: *Test of Varieties, Methods of Cutting and Planting, Test of Fertilizers.*

The plots of these several series, numbering fifty-three in all, were situated in the east garden, which is largely devoted to the cultivation of vegetables. The plots consisted of two rows, each three feet apart and two rods long. The seed was planted twelve inches apart, unless otherwise specified.

The soil is a clay loam, with a strong admixture of muck, making it black in appearance. It possessed enough of the clayey character to bake and become hard, if not properly handled. It is not thought unnecessary to give an outline plan of the plots, as their arrangement will be easily understood from the above description.

As a rule, only two varieties were used in the tests of fertilizers and methods of cutting and planting. It was thought that this would make the tests more satisfactory and reliable. The results from both varieties point to the same general conclusions.

TEST OF VARIETIES.

The Station thus far in its work has not endeavored to test a large number of varieties of potatoes. Such work requires great care, time, and expense to make it of any value, and the working force and means of the Station are limited.

Table I exhibits the results of this test, and it is only necessary to add a few notes as to manner of growth, etc.

TABLE I.

No. of plot.	Variety.	Bushels large potatoes.	Bushels small potatoes.	Total bushels potatoes per acre.	Time of ripening.	Notes on appearance as taken while digging.
1	Burbanks	194.7	21.2	215.9	August 21	"Rather above medium size," "smooth and fine."
2	Snowflakes	144.4	25.1	169.5	" 15	"Medium size," "smooth," "many small ones."
3	Seedling	184.8	14.5	199.3	Septemb'r 19	"Fair size," "smooth."
4	Belle	105.4	13.4	118.8	" 1	"Medium size," "but few small ones."
5	White Elephant	117.2	17.7	134.9	" 11	"Fair size," " " "
6	Mammoth Pearl	192.2	9.0	201.2	" 11	" " " " "
7	Late Ohio	167.1	7.8	174.9	August 21	" " " " "

These plots were planted May 19, with seed cut two to three eyes to the piece.

In the notes on quality in the above table the words "Fair size" mean above medium. Not one is marked large size. The very severe drouth during August seemed to ripen all prematurely, except one, a "seedling" which stood the drouth without any apparent injury and ripened after the middle of September. A single tuber of this variety was presented to the Station by a friend, two years ago, and the Station has watched it with considerable interest. It is a very rank grower, tubers good size, somewhat straggling in the hill. Its table qualities are excellent, and it will doubtless prove to be a valuable late variety.

It is unnecessary to give a complete history or description of the other varieties, as they are almost universally cultivated. The following brief notes will suffice for the purposes of this report:

The Early Ohio, though not included in the above list, is one of the best early market potatoes we have ever grown. The vines are small, tubers close set in the hill. It can be planted closer together than almost any other variety. It yields, under reasonably good conditions, from 175 to 200 bushels per acre.

Burbanks rank high as a market potato, and in the vicinity of Columbus command a good price. It is a little later than the Early Ohio. Tubers fair size; vines not very rank. It is only a moderately good keeper.

Snowflake is a potato of excellent quality, but so far as our experience goes, is a light yielder. It is not early, and the tubers are too small for a good market potato.

Belle—tubers are of fair size and very even. The yield as shown by the table is light.

White Elephant is a fine looking potato; table qualities excellent; tubers of rather larger size than any others grown in this test.

Mammoth Pearl—A good potato, a fair yielder, nice, even size, and has good table qualities. This is doubtless an excellent potato for second early and late market.

Late Ohio, very similar to Early Ohio; ripens a few days later and is of rather smaller size.

It is intended during 1884 to test a much larger number of varieties, including all the standard and many of the newer sorts.

METHODS OF CUTTING AND PLANTING.

This series of tests embraces a large number of plots, and it is hoped the results will be carefully examined.

Great diversity of opinion exists as to the best method of preparing potatoes for seed. Some cultivators maintain that the seed should be planted whole; others believe just as firmly in the "one eye" system of cutting. Nearly all agree that whatever method is adopted, only large, sound, well matured tubers should be used.

Failures in potato culture are nearly always traceable to poor seed, badly cut.

To show the effect of different methods of preparing the seed has been the object of the test made under the above head.

Table II gives the result of these tests.

TABLE II.

	Variety.	How cut and planted.	Bushels large potatoes.	Bushels small potatoes.	Total bushels per acre.	Time of ripening.
1	Burbanks	Cut ordinary, mulched with straw	......	......	98.9	September 11
2	Snowflakes	" " "	......	......	147.6	" 5
3	Burbanks	Cut and planted ordinary	194.7	21.2	215.9	August 21
4	Snowflakes	" "	144.4	25.1	169.5	" 15
5	Burbanks	Medium size whole potato	241.8	21.9	263.7	" 18
6	Snowflakes	" "	216.7	32.9	249.6	" 14
7	Burbanks	Small potato, whole	195.5	12.6	208.1	" 21
8	Snowflakes	" "	154.6	15.7	170.3	" 18
9	Burbanks	Large potato cut once lengthwise	212.7	22.8	235.5	" 21
10	Snowflakes	" " "	215.5	37.7	253.2	" 18
11	Burbanks	Small potato cut once lengthwise	209.6	14.9	224.5	" 25
12	Snowflakes	" " "	161.7	18.0	179.7	" 20
13	Burbanks	Large potato cut once crosswise, seed end	239.4	18.8	258.2	" 21
14	"	" " " stem end	180.5	18.0	198.5	" 21
15	"	Large potato cut to one eye	127.2	7.9	135.1	" 27
16	"	Cut to one eye reversed	146.0	9.4	155.4	September 1
17	Snowflakes	Large potato whole, thinned to 2 stalks	180.6	33.2	213.8	August 14
18	"	" " " 1 stalk	174.6	25.9	200.5	" 18
19	Burbanks	Thin slice, 2 and 3 eyes	117.9	14.6	132.5	September 11
20	"	Medium slice	160.0	14.5	174.5	" 1
21	"	Slice cut to center	176.0	17.7	193.7	" 1
22	"	Thin slice from seed end	135.2	12.6	147.8	" 11

The above table deserves careful study. The following notes call attention to some of the more important points. The time of ripening was taken with great care, as this is a very important matter to market gardeners. If early maturity can be secured by methods of seeding and cultivation the fact can scarcely fail to prove valuable.

The plots were planted May 17 and 18. The ground was very carefully prepared, and the rows furrowed out with a single shovel plow so as to put the pieces four inches below the surface. The manner of cutting is mentioned in the table, and the planting also. In a few instances, not mentioned, the pieces were covered uniformly four inches deep, except plots 19 and 22. In these the cuttings were so small it was thought best to cover them but two inches deep.

The terms "cut ordinary" and "planted ordinary," mean two to three eyes to the piece and four inches deep.

The distance in the row, twelve inches, as before stated, was measured with great exactness—every piece being placed by tape line.

Plots 1 and 2 were mulched with straw in the following manner: The pieces were placed in the furrow and slightly covered with earth, then covered with straw six to eight inches deep.

The early part of the season was so wet and cold that these plots were very slow in making their appearance, and only made about half a stand. This method of planting might prove successful in a dry season, and doubtless could be practiced in many places with profit. Thus far the Station experiments have not been successful. The size by this method of culture is considerably improved, there being few, if any, small potatoes. In the above table all are considered marketable.

Plots 3 and 4 were for comparison with plots 1 and 2. They were planted the same, except that these two plots were covered with soil.

No just comparison can be made of the yields of the two series without recalling the conditions already mentioned.

The heaviest yield of Burbanks, and in fact the heaviest yield from any single plot, is shown by No. 5. In this plot medium sized whole potatoes were planted. The heaviest yield of Snowflakes is shown in plot 10, where large potatoes cut once, lengthwise, were used.

The difference of yield between large and small potatoes (whole seed) is a matter of some importance. Our results for both 1882 and 1883, so far as yield is concerned, appear to favor large seed. In 1882 Burbanks, large, whole seed gave 301.5 bushels per acre, and the same variety, small seed, 194 bushels per acre, a difference of 107.5 bushels per acre in favor of large seed. Comparing this with the work of 1883, large seed gave a yield of 263.7 bushels per acre, and small seed, 208.1, a difference of 55.6 bushels per acre. But the amount of seed required to plant an acre must be taken into consideration before pronouncing in favor of either method. Of large potatoes, about thirty bushels are required to plant an acre, varying with size; and of small potatoes, about ten bushels. The expense of planting an acre is an important item if seed is costly. The percentage of small, or unmarketable potatoes, should also be taken into consideration. The above comparison is only for Burbanks, but about the same is true of Snowflakes. In connection with this comparison of large and small whole potatoes, it may be of interest to present a brief comparison of large potatoes, whole, and the same cut to one eye.

Much has been said of late in favor of this one-eye cutting system. The Station, without prejudice or bias of any kind, presents the results of its tests during the last two years. Before giving the figures, a few comments may aid in forming proper conclusions. The small cutting was planted just as far apart in the row as the whole potato. For exact comparison this affords a good basis but it does not indicate what can be practically accomplished by the different methods of using seed. To illustrate: Twelve inches apart in the row is as close, and possibly closer, than whole seed should be planted, (the distance will necessarily vary with the quality of the soil and habit of growth of the potato.) If whole potatoes can be planted twelve inches apart, seed cut to one eye can certainly be planted more closely, and thus more fully occupy the entire ground. This is an important consideration in favor of small cutting. By taking advantage of these facts and by thoroughly preparing the soil wonderful results have been produced from this method of cutting the seed. The enormous saving of seed is also a very important matter, though this is in part balanced by the expense of cutting. The variety used by the Station for this work was Burbanks, and the potato was carefully cut to one eye—the seed end not being used.

The yield, from large whole potatoes for 1882 and 1883 were, as before given, 301.5 bushels and 263.7 bushels per acre, respectively; and of seed cut to one eye, for the same years, 164 bushels and 135.1 bushels, respectively. The percentage of small potatoes for 1883, as shown in the above table, is about 3 per cent. greater with large whole potatoes than with the small cutting.

Attention is also called to the fact that the former ripened nine days earlier than the latter.

The method of cutting to one eye has been frequently described in agricultural journals, but to make more clear the object of the plot following it, a brief description is here given.

The tuber is botanically considered an enlargement of an underground stem, and the eyes (so-called) are simply buds.

The one eye cutting as so strenously advocated by some is partially based upon the theory that the eye is the terminal bud of a branch which starts from the center of the tuber. Now the plan of cutting is to begin at the stem and take off the first eye cutting toward the stem end and just to the center, then turn the tuber partly around bringing another eye toward you, cut this in the same manner as before, and so on, always cutting just to the center. This is said to give the complete branch with its terminal bud for a seed piece.

Whether the internal structure of the tuber is, as theoretically supposed, we do not assume to say, but to test the practical value of cutting as above described, plot 16, "cut to one eye reversed" was planted. In this plot the seed end was sliced off, then taking this end as a starting point the lower eye was cut in the same manner as previously described, bringing the cut directly across the suppose internal branch.

The result shows that this had no damaging effect on the yield. On the contrary the yield of plot 16 is greater than plot 15.

The size and quality of the tubers was about the same, plot 16 appeared to ripen a few days later than 15.

Plots 17 and 18 were planted with large, whole seed, and thinned as mentioned in the table to two and one stalk respectively. This was done to note the effect it would have upon the yield, and also upon the size of the potato.

Comparing these two plots with plot six, which was planted the same and not thinned, it is evident that reducing the number of stalks, to some extent reduced the yield, but nothing proportional to the number of stalks removed. The average number of stalks found growing from each tuber was about ten, the range being from three to fifteen.

The product of these two plots was fair for Snowflakes, but the size was not materially affected by lessening the number of stalks. The vines grew very rank and were much branched. The time of ripening of plot 18 seems to have been retarded by reducing the number of stalks.

Plots 19 to 22 were for further comparison with regard to cutting. The thin slice for plot 19 was taken from the body of the potato, and was just thick enough to include all of the eye. In fact it might be called a paring. The yield of this plot is about equal to 15.

The pieces for plot 20 was cut lengthwise of the potato, and included about half the body of the potato from the surface to the center.

For plot 21 the piece was cut just to the center. The increase in yield from plot 19 to 21 is quite marked, and would certainly indicate that thin or shallow cutting, is damaging to the yield. These pieces were all cut with not less than two, nor more than three eyes.

Plot 22 shows a remarkable yield for the very delicate little piece that was planted. In all this work the difference in rankness of growth was very marked, small cutting in some instances, especially the last, showing a very inferior growth of vines compared with the whole seed and large cutting, but in all cases the foliage seemed to be healthy.

Further comparisons might be made, but the facts are all presented in the tables, and the careful reader will not fail to understand them.

Table III gives the tests with fertilizers. These plots were all planted with ordinary cut seed in furrows as previously described. The fertilizers were evenly distributed in the furrow and thoroughly mixed with the soil previous to dropping the seed.

Two varieties, Burbanks and Snowflakes were used throughout this test.

TABLE III.

	Variety.	Fertilizer.	Bushels large potatoes.	Bushels small potatoes.	Total bushels per acre.	Time of ripening.
1	Burbanks	Wood ashes, 50 bushels per acre	191.5	11.0	202.5	August 21
2	Snowflakes	“ “ “	153.9	17.3	171.2	“ 18
3	Burbanks	Hen manure, 500 pounds per acre	223.0	17.2	240.2	“ 21
4	Snowflakes	“ “ “	127.2	21.9	149.1	“ 18
5	Burbanks	Salt, 5 bushels per acre	195.0	18.9	213.9	“ 24
6	Snowflakes	“ “ “	162.0	26.0	188.0	“ 20
7	Burbanks	Lime, 50 bushels per acre	211.6	14.9	226.5	“ 24
8	Snowflakes	“ “ “	147.0	23.6	170.6	“ 20
9	Burbanks	Superphosphate, 400 pounds per acre.	197.3	22.0	219.3	September 1
10	Snowflakes	“ “ “	143.1	39.3	182.4	August 25
11	Burbanks	Gypsum, 500 pounds per acre	163.5	18.1	181.6	September 4
12	Snowflakes *	“ “ “	48.0	11.0	59.0	
13	Burbanks	Barnyard compost, 16 tons per acre	211.3	26.7	238.0	September 1
14	Snowflakes	“ “ “	177.5	51.9	229.4	August 25
15	Burbanks	Coal ashes, 20 tons per acre	239 0	13.4	252.4	“ 27
16	Snowflakes	“ “ “	189.5	35.4	224.9	“ 21

*This plot lay in a depression where water stood during heavy rains which followed planting, and a large per cent. of the seed rotted.

Extended comment on this work is unnecessary; the facts are all set forth in the table, but for the purpose of drawing especial attention to several of the ingredients used the following abstract is made:

Fertilizer.	Total yield Burbanks.	Total yield Snowflakes.
Hen manure	240.2	149.1
Lime	226.5	170.6
Barnyard compost	238.0	229.4
Coal ashes	252.4	224.9

Quality of all, good.

The barnyard compost was well mixed with muck. From the above table it will be seen that the heaviest yield is shown by Burbanks in plot 15.

It would hardly be proper to say this plot was fertilized with coal ashes, for it is well known that they contain no element of fertility. The only explanation of the increased yield that can be given, is that of the mechanical effect of the ashes upon the soil.

The fertilizers used were of good quality, but with the few exceptions as noted in the abstract made from the above table, appear to have had no beneficial effect.

EXPERIMENTS IN CATTLE FEEDING.

This experiment was undertaken for the purpose of testing in a practical manner the value of different feeding stuffs on milk production. Experiments of this character have been rare in this country, and the reliable data on which are based the conclusions of writers on this subject are nearly all drawn from work done in Germany.

In consulting a standard American work on "Cattle Feeding*" we find not a single American experiment recorded. This valuable work is mainly a translation and compilation of the work of German investigators, "with some changes and additions to suit it to American readers." In all the literature of the subject we are unable to find any carefully conducted tests (made in the United States) which cover a sufficiently wide range of feeding stuffs, or period of time to be of any real value.

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*Armsby's Manual of Cattle Feeding.

If the results obtained by the Station tests do not substantiate the theories advanced by writers on this subject, we have only this to offer—the facts have been given and the care with which the work has been done entitles it to the confidence of the public.

The opportunities of the Station for conducting this work were not what we might have wished, yet the obstacles to be overcome were just such as the practical dairyman has to meet in his business every day, hence to all such it will have an increased value which will in part compensate for the lack of better facilities.

The feeding was done in ordinary stalls such as may be seen in any ordinary stock-barn, the dimensions are 3 ft. 6 in. width by 6 ft. 6 in. in length. The partitions between so arranged that each manger and feed box was entirely separate from the others. The cows were fastened with a chain halter which passed around the neck.

Seven stalls situated at one side of the barn, where they were separate from the rest of the stock, were selected for this work. The cows were chosen from the dairy herd belonging to the University farm, and are grade Short-horns with the exception of number four which is a grade Jersey. An effort was made to select average animals of about equal periods of lactation.

The tests here reported, excepting the chemical analyses, are just such as might be made in any dairy. The weighing of food and milk require considerable care and patience, yet the increased satisfaction of knowing just what each cow is paying for her keeping more then compensates for the time and trouble.

The previous management of these cows had been about as follows: they were given a good feed of hay, largely clover, and each morning after milking were turned into the yards where a quantity of corn stalks scattered promiscuously furnished them considerable rough feed. From weighing and calculations it was determined that the total amount of rough food consumed equaled twenty pounds good clover hay (dry matter); this then was taken as the standard quantity of rough food and remains the same throughout all the feeding. The balance of the ration was made up of beets and bran. By weighing the quantities usually given the cows, it was determined that eighteen pounds of beets twice a day was about the ordinary feed. This was taken as the standard for the experiment work. Of bran just two quarts were given twice a day. This was continued as part of the ration for the first period. The morning milking was done from 4 to 5 A. M., after which the morning feed was given and the cows turned into the yard where they remained until 1 P. M., except in very rough weather, when they were put up earlier. The afternoon milking was done from 3 to 4 P. M., after which the evening feed was given.

Care was taken to begin the milking always at the same time, and to complete it as soon as possible, but as absolute exactness could not be observed at all times the above range of time is given, which is near enough for all purposes of the test. One man did all the milking, weighing, etc.

The food and milk were weighed at all times to a half ounce on a pair of Howe scales.

The ration which was used for the first period is simply a continuation of the previous feeding just as nearly as the exact amount of food given could be determined. The object of determining this ration and using it for the first period was to get an intelligent idea of what the cows were doing on the ordinary feed used in the dairy, and then from this as a basis other rations could be introduced and comparisons easily made.

All the data relating to composition of feeding stuffs and the feeding standards here used are taken from the work previously referred to, "Armsby's Manual of Cattle Feeding," except in some instances where analyses made at the Station are used.

The following table gives the average composition of the ingredients used in the ration for the first period.

These are arranged under three head; albuminoids, fats and carbhydrates.

The albuminoids include all nitrogenous substances; the fats, all fatty matters, and the carbhydrates, the sugars, starch, cellulose, crude fiber, etc.

The total dry matter of the substance is also given; this column represents the number of pounds remaining when evaporated to dryness. The ash is not given, but is the difference between the sum of the three columns representing the food constituents and the total dry matter, except in the hay where the non-digestible part is not given in this calculation.

TABLE I.—Ration December 18 to 23, inclusive.

	Dry matter.	Albuminoids.	Fat.	Carbhydrates.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Twenty pounds of hay...	[1]20.00	[3]1.58	.28	9.22
Thirty-six pounds of beets	6.66	.36	.036	6.012
Three pounds bran........	[2]2.76	.385	.066	2.101
Totals.....................	29.42	2.325	.382	17.333
Feeding standard 1,200 pounds live weight......	28.80	3.00	.48	15.00

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[1] Calculated water free.

[2] This analysis is not taken from the work above referred to, but was made at the Station as the "New Process." Bran was used and varies much from the old in composition.

[3] A considerable portion of the hay is not digestible, hence this calculation gives the digestible quantity, in the other substances the coefficient of digestibility is so high that they are given entire.

The composition of the hay as given in the table is the best sample of Wolf's classification of clover hay. As before stated this was thought to be as near to the actual amount of rough food consumed as it was possible to determine, and this will appear as a constant quantity in all the rations.

This will be known as the beet ration and will be referred to at all times as such.

The totals show the amount of organic matter consumed by each cow pe day and just below is the feeding standard, as given in Armsby's Manual, which shows the total amount of nutritive substances which a cow of 1,20 pound live weight is supposed to use per day, to produce the best flow of milk. This ration corresponds very nearly to the standard, though as before mentione it was not calculated and arranged to conform to it, being simply the ordinary feed which the cows were receiving each day.

The standard ration is calculated at 1,200 pounds live wieght, which is nea the average weight of the herd as will be seen from the following table.

The first period lasted six days, from the morning of December 18, 1883, to the evening of the 23d. This was thought to be sufficient time to get an average o the cows on beet rations as they had been eating beets for some time previous. The animals were all weighed when put in, and afterwards each Saturday afternoon about 4 P. M. just before receiving the evening feed. The periods, excepting the first, began on Sunday morning and closed Saturday evening.

The following table gives results of first period, six days, December 18, to 23, inclusive:

TABLE II.—(First period six day.)

Number of cow.	Weight of cow at beginning of period.	Weight at close of period.	Increase or decrease + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of food.
				A. M.		P. M.						
				lbs.	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*Pounds.*
1	1,330	1,315	—15	39	0	36	8	75	8	12	9⅓	{ Beets, 216 { Bran, 18
2	1,090	1,116	+26	42	3	37	3	79	6	13	3⅔	"
3	1,160	1,120	—40	64	4	52	14	117	2	19	8⅓	"
4	1,210	1,200	—10	47	2	47	2	94	4	15	11⅓	"
5	1,300	1,296	— 4	43	10	42	9	86	3	14	5 5-6	"
6	1,270	1,296	+26	52	8	50	11	103	3	17	3⅓	"
7	1,070	1,070	00	87	13	78	13	166	10	27	12⅓	"
Totals...	8,430	8,413	—17	....	....	....	....	722	4	120	6	Beets, 1512 Bran, 126

Considerable importance attaches to the question of the value of beets in a ration for dairy cows. They can be very cheaply grown, 1,000 bushels per acre being a very ordinary crop on land adapted to their culture. Allowing this as the average yield and $40.00 per acre for cost of production (not including rent of land) it brings the cost per bushel to four cents. This estimate for cost is very liberal, while the crop can under favorable circumstances be brought up to 1,500 bushels per acre without increasing this outlay. We are unable to give any exact data in regard to the feeding value of beets, but they are largely grown for feed in Europe, also in many parts of the United States. From the above results and subsueqent tables their value would seem to be placed beyond question.

The following brief statement exhibits the financial results of the work:

Statement—First Period.

Dr.	
840 pounds hay, at 60c. cwt.	$5 04
3 days labor, at $1.50	4 50
36 bushels beets, at 4c	1 44
126 pounds bran, at 1c	1 26
	$12 24
Cr.	
722 lbs. 4 oz. milk, at 3c	$21 66¾
Balance, net profit on milk	$9 42¾

This estimate is liberal in every particular, yet shows a handsome balance over cost of production, being $0.22½ per day for each cow.

The following analyses, the first made in the morning and the second in the evening, shows the composition of the milk for this period:

Milk Analysis—First Period.

	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent.	Ash, per cent.
Morning	86.17	13.83	3.66	5.32	4.15	.70
Evening	86.83	13.17	3.18	4.69	4.67	.63

From two to four analyses of the milk were made for each period. The samples were taken from the entire milking as soon as completed after being well stirred in a large can. The analysis were made by Wanklyn's process, two indentical samples being carried through each analyses and the average results given. The average temperature for this period as taken by the Meteorogical Bureau at this place was 19° Fah.

SECOND PERIOD.

The ration for the second period was not arranged with any desire to make it conform to the feeding standard, but to make as radical a change as possible from the beet ration, so as to observe the effect or non-effects upon the animals.

The beets makes a very bulky ration and it was thought that no better change could be made than to use the meal of corn ground with cob, which makes a dry and rather concentrated food.

The following table gives the ration for second period:

TABLE III.—RATION SECOND PERIOD DECEMBER 24 TO JANUARY 5.

	Dry matter.	Albuminoids.	Fat.	Carbhydrates.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Twenty pounds hay........	20.00	1.58	.28	9.22
Four and half pounds corn and cob meal	[1]3.69	.33	.16	3.14
Totals..................	23.69	1.91	.44	12.36
Standard 1,200 pounds live weight	28.8	3.00	.48	15.00

[1] This analysis was made at the Station.

This ration is especially poor in albuminoids, the substance which is of first importance in a milk producing food. The effect of this is plainly visible in the average daily product of milk, the total product being nearly seven pounds less per day than during the previous period. Notwithstanding this loss in milk the animals show a remarkable gain in flesh for the first part of this period. This is perhaps due to the fact that having been fed beets for a considerable time they were in good condition to lay on flesh the material for which the corn ration was well calculated to supply.

Briefly stated the seven animals lost flesh at the rate of about two and a half pounds per day during the six day that beet rations were fed, and gained flesh at the rate of thirty-five pounds per day during the following six days when corn rations were fed, but fell off during the latter period in total product of milk about seven pounds per day. This loss in daily product of milk is no doubt caused in part by the change from beets to dry corn.

This period covered thirteen days, and it will be observed that the gain of flesh for the second part of the period was very slight, in fact some animals gaining while others lost, but the totals showing a gain for the herd of thirty pounds; the milk record for the second part of the period showing a slight gain in average daily product.

It should also be observed that cows "6" and "7" gained in average daily product of milk during both periods; this is a point worthy of note, and proves that animals of milking strains will often sustain a full flow of milk for some time after the food has deteriorated in milk producing substance. The loss of flesh during first period is accounted for by the fact that the severe cold weather came on at this time and animals are always known to shrink under such circumstances. The following table gives the results for this period. It is divided into two parts, for by so doing some points are brought out that would be overlooked if the period was given as a whole:

TABLE IV.—Second Period—(First part, six days.)

Number of cow.	Weights at beginning of period.	Weight at close of period.	Increase or decrease + or —.	Weight of milk. A. M.		Weight of milk. P. M.		Total weight of milk.		Average daily product of milk for each cow.		Total weight of food, corn and cob meal.
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	1,315	1,380	+65	27	3	25	2	52	5	8	11½	54
2	1,116	1,140	+24	38	0	35	0	73	0	12	2⅔	54
3	1,120	1,160	+40	59	10	54	11	114	5	19	5-6	54
4	1,200	1,230	+30	46	1	47	2	93	3	15	8½	54
5	1,296	1,360	+64	36	12	33	14	70	10	11	12⅓	54
6	1,296	1,300	+ 4	52	5	53	0	105	5	17	8 5-6	54
7	1,070	1,090	+20	94	4	75	5	169	9	28	4 1-6	54
Totals......	8,413	8,660	+247	....		....		678	5	113	5-6	378

TABTE IV.—Continued—(Second part, seven days.)

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease + or —.	Weight of milk.				Total weight of milk.		Average daily product of milk for each cow.		Total weight of food, corn and cob meal.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	1,380	1,370	—10	34	4	27	4	61	8	8	12 4-7	63
2	1,140	1,160	+20	47	1	45	15	93	0	13	4 4-7	63
3	1,160	1,180	+20	68	3	65	12	133	15	19	2 1-7	63
4	1,230	1,230	00	56	5	49	15	106	4	15	2 6-7	63
5	1,360	1,340	—20	36	9	39	4	75	13	10	13 2-7	63
6	1,300	1,290	—10	64	5	58	9	122	14	17	8 6-7	63
7	1,090	1,120	+30	109	7	93	9	203	0	29	0	63
Totals......	8,660	8,690	+30	....		....		796	6	113	12 2-7	441
Totals for period....	....	....	+277	....		....		1474	11	113	6½	819

The average daily temperature for the first part of the period was 29° and for the second part 17° Fah. From this it will be seen that the temperature for the first part of the period was 10° above that of first period, and for the second part 2° below first period, this fact should be given due prominence in considering the gain or loss in weight of the animals.

The following financial statement is made for this period:

STATEMENT—SECOND PERIOD.

Dr.	
1,820 pounds hay, at 60c. cwt	$10 92
6½ days labor, at $1.50	9 75
11.7 bushels corn, at 55c	6 45
	$27 12
Cr.	
1,474 lbs. 11 oz. milk, at 3c	$44 24
Balance net profit on milk	$17 12

In this estimate nothing is taken into consideration but actual outlay for food and labor and actual product of milk. These estimates will all be based upon the same facts and given for comparison.

The product of each cow over cost of production for this period was $0.188 per day.

The chemical analyses of the milk for this period are as follows:

MILK ANALYSIS SECOND PERIOD.

	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent.	Ash, per cent.
Morning	86.74	13.26	3.56	4.57	4.42	.71
Evening	86.87	13.13	3.58	4.48	4.41	.66

At the close of this work will be found arranged in comprehensive shape a table exhibiting the composition of feeding stuffs and of milk for each period. The samples analyzed are taken towards the last of each period.

THIRD PERIOD.

For this period the ration was practically the same as for second period, the only difference being that the corn was fed unground. The idea was to compare the unground with the ground ration.

For composition of ration refer to second period. This ration was continued for a period of fourteen days from January 6 to 19, inclusive.

The table exhibiting the results is given in two parts, as for second period, and all subsequent tables where ration is fed two weeks will be given likewise.

TABLE V.—THIRD PERIOD—(First part seven days.)

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease + or —.	Weight of milk.				Total weight of milk.		Average daily product of milk for each cow.		Total weight of food, unground.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	1,370	1,380	+10	28	5	27	2	55	7	7	14 5-7	63
2	1,160	1,140	—20	45	11	41	5	87	0	12	6 6-7	63
3	1,180	1,190	+10	68	9	68	1	136	10	19	8 2-7	63
4	1,230	1,260	+30	55	11	55	14	111	9	15	15	63
5	1,340	1,350	+10	39	14	38	6	78	4	11	2 6-7	63
6	1,290	1,340	+50	60	3	56	5	116	8	16	10 2-7	63
7	1,120	1,120	0	105	13	96	9	202	6	28	14 4-7	63
Totals......	8,690	8,780	+90	....		....		787	12	112	8 4-7	441

TABLE V.—Continued.—(Second part seven days.)

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase + or decrease or —.	Weight of milk.				Total weight of milk.		Average daily product of of milk for each cow.		Total weight of food, unground.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	1,380	1,400	+20	25	9	23	9	49	2	7	0 2-7	63
2	1,140	1,160	+20	43	5	44	9	87	14	12	8 6-7	63
3	1,190	1,190	0	63	13	69	1	132	14	18	15 5-7	63
4	1,260	1,250	—10	48	13	52	3	101	0	14	6 6-7	63
5	1,350	1,380	+30	37	9	34	15	72	8	10	5 5-7	63
6	1,340	1,320	—20	50	6	57	11	108	1	15	7	63
7	1,120	1,120	0	103	9	94	0	197	9	28	3 4-7	63
Totals......	8,780	8,820	+40	....		....		749	0	107	0	441
Totals for period......	....	....	130	....		....		1536	12	109	12 2-7	882

This unground ration seems to have had but slight effect upon the product of milk for the first part of the period, but for the second part, the falling off was over six pounds from the average of the previous period. The total average for this period is nearly four pounds less than for the second period, and nearly eleven pounds less than for the first period. The animals show a total gain of 130 pounds, or about half as much as for the second period. This loss in milk, and much smaller gain in flesh, may in part be attributed to the food not being so easily digested as previous ration. Notwithstanding, the loss in the average product of milk is considerable; cow No. 7 has showed a steady increase from the first until the second part of this period, where she drops off slightly but is still above her record for the first period.

STATEMENT—THIRD PERIOD.

DR.—1,960 pounds hay, @ 60 cents cwt	$11 76	
7 days' labor, @ $1.50	10 50	
12.6 bushels corn, @ 55 cents	6 93	
Total		$29 19
CR.—1,536 pounds and 12 ounces, @ 3 cents		46 10¼
Balance, net profit on milk		$16 91¼

This gives for each cow over cost of production $0.173 per day. The chemical analyses of the milk for this period are as follows:

MILK ANALYSIS—THIRD PERIOD.

	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids per cent.	Sugar, per cent.	Ash, per cent.
Evening	86.53	13.47	3.84	4.41	4.56	.66
Morning	85.95	14.05	3.75	4.95	4.62	.73
Evening	87.02	12.98	3.70	3.90	4.70	.68

The average daily temperature for the first part of this period was 10° Fahrenheit, and for the second part 23° Fahrenheit.

FOURTH PERIOD.

After four weeks of corn rations, the cows were put back upon beet rations. The results were not what we had anticipated, and the decline in average daily product of milk continued. The beet ration was continued but one week at this time, January 20th to 26th, inclusive.

For composition of ration see first period.

The following table gives the results:

TABLE VI.—FOURTH PERIOD—(Seven days.)

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease, + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of food, beets.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	1,400	1,420	+20	22	7	22	1	44	8	6	5 5-7	252
2	1,160	1,164	+ 4	40	13	44	4	85	1	12	2 3-7	252
3	1,190	1,210	+20	69	6	64	4	133	10	19	1 3-7	252
4	1,250	1,252	+ 2	48	7	49	2	97	9	13	15	252
5	1,380	1,382	+ 2	34	12	38	7	73	3	10	7 2-7	252
6	1,320	1,336	+16	55	13	56	9	112	6	16	6-7	252
7	1,120	1,120	0	97	10	93	6	191	0	27	4 4-7	252
Totals.........	8,820	8,884	+64	....		....		737	5	105	5 2-7	1,764

The following is the financial statement for this period:

STATEMENT—FOURTH PERIOD.

DR.—980 pounds hay, @ 60 cents cwt.	$5 88	
3½ days labor, @ $1.50	5 25	
42 bushels beets, @ 4 cents	1 68	
147 pounds bran, @ 1 cent	1 47	
Total		$14 28
CR.—737 pounds, 5 ounces milk, @ 3 cents		22 12
Balance net profit on milk		$7 84

This gives a net profit per day for each cow of $0.16. The chemical analyses of the milk for this period are here given.

MILK ANALYSIS FOR FOURTH PERIOD.

	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent.	Ash, per cent.
Evening	86.53	13.47	3.55	4.79	4.45	.68
Morning	85.84	14.16	3.88	4.71	4.78	.73

The average temperature for this period was 7° Fahrenheit.

FIFTH PERIOD.

This period lasted from January 27th to February 9th, inclusive, and during this period we endeavored to make the ration conform as nearly to the standard as possible, the object being to produce the largest possible flow of milk.

The ration selected for this period was a mixture of corn and oats in the ratio of three parts of the former to two parts of the latter by weight. This makes an excellent food, and was given 16 pounds per day, in two feeds with the usual feed of hay.

TABLE VII.—RATION FOR FIFTH PERIOD, JANUARY 27 TO FEBRUARY 9.

	Dry matter.	Albuminoids.	Fats.	Carbhydrates.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
20 pounds hay	20.00	1.58	.28	9.22
9.6 pounds corn	8.53	1.00	.46	6.73
6.4 pounds oats	5.64	.62	.30	4.16
Totals	34.17	3.20	1.04	20.11
Standard, 1,200 pounds live weight	28.8	3.00	.48	15.00

This ration, it will be seen, exceeds the standard in every particular, but the average weight of cows for this period was considerably above 1,250 pounds. This feed, though considered to be very heavy, was eaten with great relish, and the animals appeared to be in prime condition during the whole time. The weights disclose the fact that the gain in flesh was but slight for the first part of the period, and the loss for the second part was quite marked, being over twenty pounds per head. To counterbalance the loss in flesh during this period, we have a gain of nearly eight pounds in average daily product of milk. Cow No. 7, which has shown an excellent record thus far, reaches her maximum during the first part of this period, where she shows an average daily product of 29 pounds 13 2-7 ounces.

This cow has produced thus far an average of about twenty-eight pounds of milk per day, and the average cost per day has been about thirty cents, which leaves a net profit of fifty-four cents per day.

The following table exhibits the results in detail for the period:

TABLE VIII.—FIFTH PERIOD—(First part seven days.)

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease, + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of hay, corn and oats chopped.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	1,420	1,420	0	21	2	22	10	43	12	6	4	112
2	1,164	1,170	+ 6	47	13	46	9	94	6	13	7 5-7	112
3	1,210	1,195	—15	74	1	74	6	148	7	21	3 2-7	112
4	1,252	1,285	+33	52	15	55	15	108	14	15	8 6-7	112
5	1,382	1,430	+48	36	3	37	11	73	14	10	8 6-7	112
6	1,336	1,310	—26	60	7	52	0	112	7	16	1	112
7	1,120	1,130	+10	110	3	98	10	208	13	29	13 2-7	112
Totals.........	8,884	8,940	+56	....		....		790	9	112	15	784

TABLE VIII.—Continued—(Second part seven days.)

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease, + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of food, corn and oats chopped.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	1,420	1,410	—10	20	10	20	13	41	7	5	14 5-7	112
2	1,170	1,150	—20	49	13	44	7	94	4	13	7 3-7	112
3	1,195	1,160	—35	77	2	73	15	151	1	21	9 2-7	112
4	1,285	1,250	—35	55	12	57	8	113	4	16	2 6-7	112
5	1,430	1,400	—30	37	12	36	8	74	4	10	9 5-7	112
6	1,310	1,310	0	62	12	57	9	120	5	17	3	112
7	1,130	1,100	—30	108	11	93	13	202	8	28	14 6-7	112
Totals..........	8,940	8,780	—160	....	....	....	....	797	1	113	13 6-7	784
T'ls for period..	....	....	—104	....	....	....	....	1,587	10	113	6 3-7	1,568

The following is the statement of cost of production for this period:

STATEMENT—FIFTH PERIOD.

Dr.—	1,960 pounds hay, @ 60 cents cwt	$11 76	
	7 day labor, @ $1.50	10 50	
	16.8 bushels corn, @ 55 cents	9 24	
	19.6 bushels oats, @ 43 cents	8 43	
	Total		$39 93
Cr.—	1,587 pounds 10 ounces milk, @ 3 cents		47 63
	Balance net profit on milk		$7 70

Profit of each cow per day, 7 6-7 cents. This is the lowest rate of profit yet reached, and that with what was considered the very best of food. But the question of whether this was a wasteful ration or not cannot be readily answered. From the results as here exhibited it would seem that the quantity of food was greater than the animal could make use of, hence was lost so far milk production was concerned.

This low rate of profit is not caused by a decrease in total product of milk, for this period shows the greatest average daily product of any except the first, but by increased cost of food.

The following four analyses of the milk were made during this period.

ANALYSIS OF MILK FOR FIFTH PERIOD.

	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent.	Ash, per cent.
Morning	86.73	13.27	3.47	3.98	5.16	.66
Evening	86.98	13.02	3.09	4.15	5.10	.68
Morning	86.54	13.46	3.42	4.67	4.64	.73
Evening	87.13	12.87	3.28	3.85	5.09	.65

The composition of the milk is very constant during the different periods, except the sugar of this period, which is considerably above the average. The average temperature for the first part of this period was 32° Fahrenheit and for the second part 39° Fahrenheit.

SIXTH PERIOD.

For this period the ration was changed but slightly, the corn remaining the same, and in place of the 6.4 pounds of oats per day, 6 pounds of bran were used. This makes the ration a little cheaper than the previous one, but, as will be seen, all of the cows lost in average daily product of milk except No. 1, which was a new cow.

TABLE IX.—RATION SIXTH PERIOD, FEBRUARY 10 TO 23, INCLUSIVE.

	Total dry matter.	Albuminoids.	Fats.	Carbhydrates.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
20 pounds hay...............	20.00	1.58	.28	9.22
9.6 pounds corn..............	8.53	1.00	.46	6.73
6 lbs bran (new process)	5.58	.77	.13	4.20
Totals......................	34.11	3.35	.87	20.15
Standard 1,200 live w'gt.	28.8	3.00	.48	15.00

This ration was also above the standard, yet was eaten with relish. The totals for period show a loss in live weight of 5 pounds, and the individual records of the cows, compared with previous period, show a loss of milk in every instance except No. 1, as previously mentioned.

It is to be regreted that this set of cows should be broken before the conclusion of the experiment, but No. 1 had fallen so low in daily product of milk that the farm superintendent wished to sell her and fill her place with another animal. While this changes considerably the total daily average product of milk, it does not in the least interfere with the individual records of the other animals, nor prevent a careful comparison of the same.

It is rather interesting to notice the variations in weight of cow No. 1. At the close of the first period she weighed 1,315 pounds, having lost 15 pounds during the period; at the close of the fourth period she weighs 1,420 pounds, but at the close of the fifth period, when she was removed, she had dropped to 1,410 pounds, and was receiving at this time the richest ration of any of the periods.

The following table exhibits the results in detail for the period.

TABLE X.—Sixth Period—(First part, seven days).

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease, + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of food, corn and bran.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	*	940	....	73	5	77	3	150	8	21	8	108½
2	1,150	1,160	+10	49	13	43	12	93	9	13	5 6-7	108½
3	1,160	1,180	+20	73	12	69	4	143	0	20	6 6-7	108½
4	1,250	1,240	—10	53	8	51	14	105	6	15	6-7	108½
5	1,400	1,410	+10	33	8	31	10	65	2	9	4 6-7	108½
6	1,310	1,310	....	61	9	57	7	119	0	17		108½
7	1,100	1,120	+20	110	13	90	6	201	3	28	11 6-7	108½
Totals	7,370	7,420	+50	....	....	....	....	877	12	125	6 2-7	759½

* Only weight at close of period is given.

TABLE X.—Continued—(Second part, seven days).

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease, + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of food, corn and bran.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	940	955	+15	83	3	83	6	166	9	23	12 5-7	108½
2	1,160	1,155	— 5	44	13	41	13	86	10	12	6	108½
3	1,180	1,170	—10	73	12	64	14	138	10	19	12 6-7	108½
4	1,240	1,230	—10	50	12	52	9	103	5	14	12 1-7	108½
5	1,410	1,390	—20	31	3	28	7	59	10	8	8 2-7	108½
6	1,310	1,305	— 5	58	0	51	13	109	13	15	11	108½
7	1,120	1,100	—20	100	12	91	12	192	8	27	8	108½
Totals	8,360	8,305	—55	....	....	....	....	857	1	122	7	759½
Totals for period	....	....	— 5	....	....	....	....	1,734	13	123	14 9-14	1,519

The financial statement for this period is here given:

STATEMENT—SIXTH PERIOD.

Dr.—1,960 pounds hay, @ 60 cents cwt.	$11 76	
7 days' labor, @ $1.50	10 50	
16.8 bushels corn, @ 55 cents	9 24	
578.2 pounds bran, @ 1 cent	5 782	
Total		$37 282
Cr.— 1,734 pounds 13 ounces milk, @ 3 cents		52 045
Balance net profit on milk		$14 763

Profit on each cow per day, 15 cents. This is about double the profit of the previous period, some of which is to be attributed to reducing the cost of rations, and the remainder to increased product of milk from cow No. 1. The increase in daily average during the period amounted to more than 10 pounds per day, but this is not to be considered just as the increase of cow No. 1 over former No. 1, for, on the contrary, the other cows all lost in daily product of milk, and the increase of No. 1, after supplying this deficiency, leaves the increased daily average as above given.

MILK ANALYSIS, SIXTH PERIOD.

	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent.	Ash, per cent.
Evening	86.84	13.16	3.41	4.77	4.28	.70
Morning	87.12	12.88	3.17	4.14	4.89	.68
Evening	86.85	13.15	3.67	3.91	4.88	.69
Morning	86.48	13.52	3.73	4.37	4.72	.70

The average daily temperature for the first part of the period was 35° Fahrenheit, and for the second part 36° Fahrenheit.

SEVENTH PERIOD.

For this period we wished to introduce into the ration a small qnantity of cotton seed meal to take the place of part of the corn.

The following table gives the amounts of the several ingredients used in the daily ration and their composition:

TABLE XI.—RATION SEVENTH PERIOD, FEBRUARY 23 TO MARCH 8.

	Total dry matter.	Albuminoids.	Fats.	Carbhydrates.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
20 pounds hay	20.00	1.58	.28	9.22
4½ pounds corn meal	4.00	.47	.21	3.36
6 lbs bran (new process)	5.58	.77	.13	4.20
1½ lbs cotton seed meal	*1.41	.56	.25	.47
Totals	30.99	3.38	.87	17.25
Standard 1200 lbs l've wt.	28.8	3.00	48	15.00

* This analysis was made at the Station.

This ration exceeds the standard in every particular, but is near enough for all practical purposes. This is a rich ration. Prof. L. B. Arnold says, in speaking of it: "It is enough to support 1200 pounds live weight and produce 45 pounds of milk a day." In but one case did it produce half that amount, hence we must conclude from the foregoing that the ration contained much more nutritive substance than the cows could assimilate. They ate it very sparingly at first and did not seem to relish it at any time, as other rations, but by moistening and sprinkling lightly with salt they were induced to eat the required amount. No. 3 showed unmistakeable signs of disturbance of the digestive organs during the second part of this period and was removed to a box stall and given a light ration of corn and hay, when she soon recovered. Her record is necessrrily suppressed for the latter part of the period. Cow No. 7 appeared slightly unwell during the last day of the test, but as the food was then changed for the next period she showed no further symptoms and was not removed from the stall. These two animals lost flesh for the period, while all the others made reasonable gains, but without exception, lost in daily product of milk. The following table gives the results of the period in detail:

TABLE XII.—Seventh Period—(First part, seven days.)

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease, + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of food.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	955	970	+15	80	13	70	9	57	6	22	7 5-7	84
2	1,155	1,180	+25	41	11	30	0	80	11	11	8 8-7	"
3	1,170	1,180	+10	62	7	58	0	120	7	17	3 2-7	"
4	1,230	1,250	+20	49	15	47	5	97	4	13	14 2-7	"
5	1,390	1,415	+25	28	11	28	2	56	13	8	1 6-7	"
6	1,305	1,320	+15	56	14	48	10	105	8	15	1 1-7	"
7	1,100	1,115	+15	93	13	78	13	172	10	24	10 4-7	"
Totals.....	8,305	8,430	+125	....	....	....	....	790	11	112	15 2-7	588

TABLE XII.—Continued—(Second part, seven

Number of cow.	Weight at beginning of period.	Weight at close of period.	Increase or decrease, + or —.	Weight of milk.				Total milk.		Average daily product of milk for each cow.		Total weight of food.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*
1	970	1,010	+40	79	6	69	12	149	2	21	4 6-7	84
2	1,180	1,200	+20	41	8	40	9	82	1	11	11 4-7	"
*3												"
4	1,250	1,250	0	46	4	48	3	94	7	13	7 4-7	"
5	1,415	1,420	+ 5	30	1	27	9	57	10	8	3 5-7	"
6	1,320	1,335	+15	55	6	52	0	107	6	15	5 3-7	"
7	1,115	1,095	—20	92	11	81	6	174	1	24	13 6-7	"
Totals	7,250	7,310	+60					664	11	94	15 2-7	504
T'ls for period			+185					1,455	6	103	15 2-7	1,092

* Unwell.

The following statement exhibits the financial results of the work:

STATEMENT—SEVENTH PERIOD.

DR.—1,820 pounds hay, at 60c. cwt	$10 92
7 days labor, at $1.50	10 50
546 pounds bran at 1c	5 46
136½ pounds cotton seed, at $1.35 cwt	1 84
73 bushels corn, at 55c	4 01
	$32 73
CR.—1,455 ℔. 6 oz. milk, at 3c	$43 66
Balance net profit on milk	$10 93

Profit per day on each cow twelve cents, a falling off of three cents from statement of last period.

The following are the analyses of milk for this period.

MILK ANALYSIS—SEVENTH PERIOD.

	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent.	Ash, per cent.
Evening	87.45	12.55	3.39	3.99	4.49	.68
Morning	85.65	14.35	3.93	4.46	5.21	.72
Evening	86.81	13.19	3.66	4.75	4.09	.69
Morning	86.10	13.90	3.84	4.59	4.77	.70

The average daily temperature for the first part of the period was 23.5° Fah. and for the second part 21.6° Fah.

EIGHTH PERIOD.

This period extended from March 9th to 22d, inclusive, and closes the experiment in cattle feeding. The ration was like the former beet ration, with the exception that in place of the bran eight pounds of corn and oat meal were used. This meal was mixed in the same proportion of that used in ration No. 5. After working for eleven weeks on various other rations it was thought proper to again test the beet ration.

The composition of the ration is here given.

TABLE XIII.—RATION EIGHTH PERIOD, MARCH 9TH TO 22D, INCLUSIVE.

	Total dry matter.	Albuminoids.	Fats.	Carbhydrates.
	lbs.	*lbs.*	*lbs.*	*lbs.*
20 pounds hay..................	20.00	1.58	.28	9.22
36 pounds beets..................	6.66	.36	.036	6.012
8 lbs. corn and oat meal...	*7.35	.89	.43	6.012
Totals....................	34.01	2.83	.746	21.244
Standard 1200 lbs. live wt.	28.8	3.00	.48	15.00

*This analysis was made at the Station.

This ration is light in albuminoids but exceeds the standard in every other particular. The following table exhibits the results for the period.

TABLE XIV.—EIGHTH PERIOD—(First part, seven days.)

Number of cow.	Weight of cow at beginning of period.	Weight of cow at close of period.	Increase or decrease, + or —.	Weight of milk for period.				Total weight of milk.		Average daily product of milk for each cow.		Total weight of food.
				A. M.		P. M.						
	lbs.	lbs.	lbs.	lbs.	oz	lbs.	oz.	lbs.	oz.	lbs.	oz.	
1	1,010	1,010	00	74	4	69	6	143	10	20	8 6-7	56 lbs corn and oat meal. 252 lbs. beets.
2	1,200	1,230	+30	42	0	38	3	80	3	11	7 2-7	252 "
3	1,160	1,200	+40	66	1	60	9	126	10	18	1 3-7	252 "
4	1,250	1,270	+20	48	7	48	13	97	6	13	14 4-7	252 "
5	1,420	1,430	+10	28	4	27	14	56	2	8	2-7	252 "
6	1,335	1,320	—15	55	9	51	2	106	11	15	3 6-7	252 "
7	1,095	1,140	+45	94	10	84	0	178	10	25	8 3-7	252 "
Totals	8,470	8,600	+130	....	....	....	....	789	4	112	12	392 lbs corn and oat meal 1,764 lbs. beets.

TABLE XIV.—Continued—(Second part, seven days.)

Number of cow.	Weight of cow at beginning of period.	Weight of cow at close of period.	Increase or decrease, + or —.	Weight of milk for period.				Total weight of milk.		Average daily product of milk for each cow.		Total weight of food.
				A. M.		P. M.						
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	
1	1,010	1,020	+10	65	10	49	0	114	10	16	6	56 lbs corn and oat m'l. 252 lbs beets.
2	1,230	1,210	—20	39	8	36	1	75	9	10	12 5-7	252 "
3	1,200	1,210	+10	63	12	58	12	122	8	17	8	252 "
4	1,270	1,280	+10	49	8	50	12	100	4	14	5 1-7	252 "
5	1,430	1,460	+30	28	3	80	9	58	12	8	6 -27	252 "
6	1,320	1,360	+40	53	8	51	1	104	9	14	15	252 "
7	1,140	1,120	—20	92	7	81	14	174	5	24	14 3-7	252 "
Totals	8,600	8,660	+60	......		......		750	9	107	3 4-7	392 lbs corn and oats. 1,764 lbs beets.
Totals for period			+190					1,539	13	109	15 11-14	784 lbs corn and oat m'l. 3,528 lbs beets.

The animals gained considerable in flesh during this period, but the milk record shows about the same decrease in daily product.

The financial statement for the period is here given:

STATEMENT—EIGHTH PERIOD.

DR.—1,960 pounds of hay, at 60c. cwt	$11 76
7 days labor, at $1.50	10 50
84 bushels beets, at 4c	3 36
7.3 bushels oats, at 43c	3 14
6.2 bushels corn, at 55c	3 41
	$32 17
CR.—1,539 lbs. 13 oz. milk, at 3c	$46 195
Balance net profit on milk	$14 025

This leaves a profit of fourteen cents per day for each cow, two cents better than for last period. This must be mainly attributed to reducing the cost of ration as there was a slight diminution in the average daily product of milk. This loss averaged about three ounces per day, showing that the beet ration held the herd nearly up to the average yield of milk.

The following are the milk analyses for this period:

MILK ANALYSIS—EIGHTH PERIOD.

	Water, per cent.	Total solids, per cents.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent,	Ash, per cent.
Morning	87.04	12.96	3.13	4.41	4.72	.70
Evening	86.88	13.12	3.43	4.15	4.84	.70
Morning	86.81	13.19	3.51	4.25	4.74	.69
Evening	87.22	12.78	3.19	4.25	4.65	.69

The average daily temperature for the first part of this period was 34.5° Fah. and for the second part 45.6° Fah.

The following table gives the ingredients of the ration for each of the several periods in pounds, and the chemical composition of the milk in percentages for the same, also the total product of milk for period, and the daily profit per head of the several cows:

TABLE XV.

Number of period.	Kind of ration.	Daily rations for the several periods				Average composition of milk for the several periods.									Time of period.
		Total dry matter.	Albuminoids.	Fats.	Carbhydrates.	Water, per cent.	Total solids, per cent.	Fats, per cent.	Total albuminoids, per cent.	Sugar, per cent.	Ash, per cent.	Total product of milk for period.		Daily average profit per head.	
			lbs.	*lbs.*				*					*oz.*		
1	Beets with bran	29.42	2.33	.33	17.33	86.50	13.50	3.42	5.00	4.41	.66	722	4	$0.225	6 days.
2	Corn and cob ground	23.69	1.91	.44	12.36	86.81	13.19	3.57	4.42	4.41	.68	1474	11	.188	13 "
3	Corn and cob unground	23.69	1.91	.41	12.36	86.50	13.50	3.76	4.42	4.62	.69	1536	12	.173	14 "
4	Beets with bran		as	first	period.	86.18	13.82	3.71	4.75	4.61	.70	737	5	.160	7 "
5	Corn and oats ground	34.17	3.20	1.04	20.11	86.84	13.16	3.81	4.16	4.99	.68	1587	10	.078	14 "
6	Corn meal and bran	31.11	3.35	.37	20.15	86.82	13.18	3.49	4.30	4.69	.69	1784	13	.150	14 "
7	Corn meal, bran and cotton seed meal	30.99	3.38	.37	17.25	86.50	13.50	3.70	4.44	4.64	.69	1455	6	.120	14 "
8	Beets, corn and oat meal	34.01	2.33	.74	21.24	86.98	13.02	3.31	4.26	4.73	.70	1539	13	.140	14 "

*The average percentages are carried to but two places ecimals.

EXPERIMENT IN PIG FEEDING.

To show the comparative effect of shelter and exposure in the flesh production of fattening pigs, and to give some idea of the amount of corn required to produce a given weight of pork, the following experiment was conducted:

December 7th ten pigs were separated into two lots of five each and placed in pens previously prepared.

Lot No. 1 was placed in a tight pen made with double walls, the interspaces packed with chaff, the doors and windows all made double, and the roof carefully sealed. This pen, when closed tight, is almost frost-proof.

Lot No. 2 was placed in an open board pen, the same size as No. 1, but in which no attempt was made to protect the pigs from the cold. The pen had a board floor and one-half was roofed over with boards to protect the pigs from snow and rain. A good bedding of straw was provided. The temperature was that of the outdoor atmosphere at all times.

Lot No. 1 consisted of four barrows and one sow, dropped about July 15, (except one which was dropped about June 1).

They had been fed previous to beginning the experiment what corn they would eat, and allowed free range of a large yard, in which was a quantity of straw. This allowed the pigs as warm a nest as they chose to make. They were pure bred Berkshires, and to all appearances, were a fine, thrifty lot of pigs.

Lot No. 2 consisted of three sows and two barrows, of which two were of the first litter mentioned above, viz: Dropped June 1. The other three were of the later litter.

The remarks on Lot No. 1 apply to Lot No. 2. All the pigs were apparently in the best of health.

In separating the two lots the preference in size was given to the outside pen—those in the closed pen weighing 650 pounds, while those outside weighed 680 pounds.

For the first two periods Lot No. 2 were somewhat affected by their close confinement and exposure. They all coughed more or less, and it was not until the beginning of the third week that they appeared to be in good, thriving condition. The gain made during the third period was remarkable. The weather was pleasant, and every one who observed the pigs remarked their improvement.

Lot No. 1 ate well from the start, and to all appearances, were in nowise affected by their confinement.

The pigs were fed corn in the ear twice daily, care being taken to give them just what they would eat. They had access to pure water at all times. It was the intention to feed corn in the ear during the whole experiment, but having facilities for coarsely grinding the corn with the cob, this was done for the sixth and seventh periods. During the fifteenth period, in addition to the corn, fifty-four pounds of carrots were given to each lot. During the sixteenth period 168 pounds were fed to each. The temperature was recorded at each feeding, and the average for the seven days taken for the average temperature for the period.

Table No. 1 gives the general results of the experiment.

TABLE No. 1.

Lot.	Weight at beginning of week.	Weight at end of week.	Increase or decrease, + or —.	Amount of corn eaten for period.	Pounds of corn for one pound of increase.	Average temperature for period.
First Period, Nine Days, from December 7 to 15, Inclusive.						
	lbs.	*lbs.*	*lbs.*	*s.*	*lbs.*	
Lot 1................	650	676	+26	342	13	44°
Lot 2................	680	686	+ 6	283	47	36°
Second Period, Seven Days, from December 16 to 22, Inclusive.						
Lot 1................	676	710	+34	229	6½	39°
Lot 2................	686	690	+ 4	176	44	19°
Third Period, Seven Days, from December 23 to 29, Inclusive.						
Lot 1................	710	720	+10	187	18½	44°
Lot 2................	690	740	+50	194	4	29°
Fourth Period, Seven Days, from December 30 to January 5, Inclusive.						
Lot 1................	720	760	+40	207	5	35°
Lot 2................	740	750	+10	238	24	17°
Fifth Period, Seven Days, from January 6 to 12, Inclusive.						
Lot 1................	760	800	+40	217	5½	34°
Lot 2................	750	780	+30	235	8	10°

[1] Sixth Period, from January 13 to 19, Inclusive.

Lot.	Weight at beginning of week.	Weight at end of week.	Increase or decrease, + or —.	Amount of corn eaten for period.	Pounds of corn for one pound of increase.	Average temperature for period.
	lbs.	*lbs.*	*lbs.*	*lbs.*	*lbs.*	
Lot 1	800	790	—10	133	....	30°
Lot 2	780	784	+ 4	113	33	23°
[2] Seventh Period, from January 20 to 26, Inclusive.						
Lot 1	790	800	+10	157	16	28°
Lot 2	784	786	+ 2	160	80	7°
Eighth Period, from January 27 to February 2, Inclusive.						
Lot 1	800	830	+30	197	6½	42°
Lot 2	786	796	+10	199	20	32°
Ninth Period, Februar 3 to 9, Inclusive.						
Lot 1	830	842	+12	221	18½	46°
Lot 2	796	820	+24	218	9	39°
Tenth Period, February 10 to 16, Inclusive.						
Lot 1	842	865	+23	224	9½	41°
Lot 2	820	840	+20	226	11½	35°
Eleventh Period, February 17 to 23, Inclusive.						
Lot 1	865	880	+15	213	14	44°
Lot 2	840	860	+20	215	10½	36°
Twelfth Period, February 24 to March 1, Inclusive.						
Lot 1	880	900	+20	219	11	38°
Lot 2	860	865	+ 5	232	46	24°

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[1] Corn and cob coarsely ground.

[2] " " "

THIRTEENTH PERIOD, MARCH 2 TO 8, INCLUSIVE.

Lot.	Weight at beginning of week.	Weight at end of week.	Increase or decrease, + or —.	Amount of corn eaten for period.	Pounds of corn for one pound of increase.	Average temperature for period.
Lot 1	900	915	+15	181	12	37°
Lot 2	865	870	+ 5	214	43	22°
FOURTEENTH PERIOD, MARCH 9 TO 15, INCLUSIVE.						
Lot 1	915	920	+5	161	32	42°
Lot 2	870	870	00	171	....	35°
[3] FIFTEENTH PERIOD, MARCH 16 TO 22, INCLUSIVE.						
Lot 1	920	940	+20	174	8½	51°
Lot 2	870	890	+20	161	8	46°
[4] SIXTEENTH PERIOD, MARCH 23 TO 29, INCLUSIVE.						
Lot 1	940	1,000	+60	179	3	56°
Lot 2	890	930	+40	137	4½	53°

[3] 54 pounds carrots in addition to corn.

[4] 168 " " "

TABLE II.

	Lot No. 1.				Lot No. 2.			
	Pigs in closed pen.				Pigs in open pen.			
	Average temperature.	Total feed.	Total increase.	Pounds of corn for 1 lb. of increase.	Average temperature.	Total feed.	Total increase.	Pounds of corn for 1 lb. of increase.
First period	44°	342	26	13.	36°	283	6	47.
Second period	39°	229	34	6.5	19°	176	4	44.
Third period	44°	187	10	18.5	29°	194	50	4.
Fourth period	35°	207	40	5.	17°	238	10	24.
Fifth period	34°	217	40	5.5	10°	235	30	8.
Sixth period	30°	132	—10	....	23°	133	4	33.
Seventh period	28°	157	10	16.	7°	160	2	80.
Eighth period	42°	197	30	6.5	32°	199	10	20.
Ninth period	46°	221	12	18.5	39°	218	24	9.
Tenth period	41°	224	23	9.5	35°	226	20	11.5
Eleventh period	44°	213	15	14.	36°	215	20	10.5
Twelfth period	38°	219	20	11.	24°	232	5	46.
Thirteenth period	37°	181	15	12.	22°	214	5	43.
Fourteenth period	42°	161	5	32.	35°	171	....	....
Fifteenth period	51°	174	20	8.5	46°	161	20	8.
Sixteenth period	56°	179	60	3.	53°	187	40	4.5
Totals and averages	....	3,240	350	9.25	....	3,242	250	13.

The results of the experiments show that each lot of pigs consumed about the same amount of corn, there being a difference of only two pounds. The 3,240 pounds of corn fed to the "pigs in closed pen" gave an increase of 350 pounds in weight. The 3,242 pounds fed to "pigs in open pen" gave an increase of 250 pounds in weight. That is, in the latter case it required thirteen pounds of corn for every pound of increase, while in the former nine and one-fourth pounds gave the same result.

These facts prove the ruinous waste of leaving pigs exposed to severe frosts and cold winds.

The extra corn fed to the pigs outside served simply as fuel. It did not put on flesh, but was all used in keeping up the animal heat. Not being protected from without by sufficient shelter, they had to be warmed from within by costly food.

It will be seen from the following table that the increase for the feed consumed was much the smallest during the periods of lowest temperature:

TABLE III.

		Total increase.	Total corn fed.	Pounds of corn for one pound of increase.	Pounds of increase for each bushel of corn.
Periods of lowest temperature. Nos. 2, 4, 5, 7, 12, 13	Pigs in open pen	71	1,255	17.6	3.97
	Pigs in closed pen	159	1,210	7.5	9.33
Periods of highest temperature Nos. 1, 8, 9, 10, 11, 14	Pigs in open pen	80	1,312	16.4	4.26
	Pigs in closed pen	111	1,358	12.2	5.74

The above table shows that during six periods of lowest temperature it required for the pigs in open pen 17.6 pounds of corn for each pound of increase; or every bushel (70 pounds) of corn fed, gave a *trifle less than four pounds additional weight.* During the same period the pigs in closed pen required only 7.5 pounds of corn for each pound of increase; or *every bushel of corn fed gave nine and one-third pounds additional weight.*

The difference between the two lots during the periods of highest temperatures is much less marked.

It is but fair to state that this experiment was suggested by the very careful and elaborate work done in the same direction by Prof. E. M. Shelton, of the Kansas Agricultural College. Those who have seen the report of Prof. Shelton's experiment can scarcely fail to note the substantial agreement in his results and those obtained by the Station. *Good shelter* is just as essential for profitable pig feeding in Ohio as it is in Kansas.

REPORT ON GARDEN VEGETABLES.

PEAS.

The following varieties of peas were sown April 11, in a moderately rich clay loam.

The conditions were, as nearly as possible, alike for all.

The most conclusive evidence shown by the test is that the Extra Earlies, First and Best, etc., of different seedsmen are nearly identical. Differences, of course, can be noted, but they are mainly such differences as are unimportant. Some, however, notably from D. M. Ferry & Co. and Peter Henderson & Co., show evidence of careful selection; that is, there is greater uniformity in time of ripening and quality of product than of any of the others.

American Wonder.—This was planted for comparison as it is already well known. It is a sweet wrinkled pea growing about eight inches high. It is the best of the wrinkled varieties, although in this trial many of the pods did not fill perfectly. The crop was ripened in a comparatively short time, being nearly all taken at two pickings. Average number of peas to the pod 6. Ready for use June 20.

Blue Peter.—This is also a well known variety. In comparison with others it did very poorly. Most of the pods contained only two or three peas. The vines also mildewed considerably. It commenced ripening with the American Wonder, but continued longer in bearing, making it unprofitable for market.

D. M. Ferry & Co.'s First Best.—This a smooth variety, growing about two feet high. The vines are healthy and vigorous, and loaded with well filled pods. The peas mature evenly and within a very short time; yielding nearly all the crop at two pickings. Nearly all the pods were well filled, containing six to eight peas. This is certainly one of the very best early market peas. For table use the quality is not equal to the sweet varieties, but is as good as any of the smooth.

A few pods were fit to pick June 15. The first picking was made June 18.

Henderson's First of All.—This resembles the preceding, and is fully equal to it in every respect, and perhaps superior in evenness of maturity. Height of vine about two feet; number of peas to the pod 6 to 8; fit to pick June 18; a few pods quite well filled June 15.

Little Gem.—A well known wrinkled variety, of larger growth and a few days later than American Wonder.

The pods did not fill well; many of them containing only three peas, although large enough to contain twice the number. Ready to pick June 20.

Market Garden (Horsford.)—This a new wrinkled variety that promises well as an intermediate or second early pea. The vines are healthy and vigorous growing to the height of two and one half feet. The pods are borne in pairs and are usually well filled, containing 5 to 6 peas. First peas ready to pick June 25. At this date the vines were still in bloom, showing that they will continue long in bearing; making it more valuable for home use than for market.

Racket.—A cross between Alpha and American Wonder. The vines are healthy and vigorous, growing four to five feet high. Ripens about the same time as Market Garden. Pods contain 5 to 6 peas.

This is apparently not so desirable as the Market Garden.

Silbey's First and Best.—This is about as early as any, but matures quite unevenly, and the pods do not fill very well. Height of vines about two feet. First peas ready to pick June 20. Pods contain 4 to 6 peas; many of the pods not well filled.

Tom Thumb.—Too well known to need any description. This variety did not sustain its reputation. The vines mildewed, and the pods were poorly filled. First peas ready for use June 18.

Vick's Extra Early.—A smooth variety, growing about two feet high. Vigorous and healthy, but many of the pods not well filled; ripened unevenly. Pods contain 3 to 6 peas. Ready for use June 20.

TOMATOES.

The experiments with tomatoes embraced—

First. A trial of varieties.

Second. A comparison as to earliness of potted and unpotted plants.

Third. A comparison as to earliness of tomatoes from seed gathered at different dates.

Seed procured from different seedsmen showed such great variation that the task of judging correctly as to the comparative merits of varieties was difficult.

Tomatoes grown from the seed of the same varieties, procured from different sources, varied not only in size and shape but in earliness. For instance, Trophy seed from most sources produced rough, unmarketable tomatoes; while that which had been carefully selected produced tomatoes of much better quality and several days earlier.

Some old and well known varieties were grown for the sake of comparison.

The varieties were all sown March 16, except Essex Hybrid, Acme and Perfection, which were sown April 9.

Acme.—This is a well known variety and needs no description. It is one of the best, its greatest fault being a tendency to rot. Commenced ripening August 9. At its best about September 1.

Alpha.—The only merit of this variety is its earliness. It is too small to compete with the larger varieties in market. Commenced ripening August 1. At its best August 20.

Canada Victor.—This variety is usually quite too small for market, but seed obtained from Gregory produced very fine tomatoes, rather above medium size. If improved by careful selection this is one of the best of varieties. Commenced ripening August 1.

Essex Hybrid.—The tomatoes of this variety are not large but very regular and even sized. Although not among the earliest, it is a valuable variety. Commenced ripening August 14.

Gen. Garfield.—Large, but rough and irregular. Not worthy of cultivation. Commenced ripening August 11.

Golden Queen.—This is a very fine, large, smooth, yellow variety and is every way worthy of cultivation, except in markets where its color is objectionable. First ripe specimens August 9.

Hathaway's Excelsior.—This is an old variety, but it will hold its own with many of the new kinds. Ripe August 9.

Hubbard's Curled Leaf.—This is but few days earlier than many better kinds. Very irregular and unsalable. Commenced ripening August 1.

Large Red.—Large size, but rough. First specimens ripe August 9.

Mayflower.—Too much cannot be said in praise of this variety. It is large, smooth, fine, glossy red, firm and productive. Ripe August 6.

Paragon.—On old and well known variety. First specimens ripe August 11.

Perfection.—An excellent variety, too well known to need description. Commenced ripening August 9.

Rochester.—About the same size but of darker color than the Mayflower. A valuable variety. Ripe August 11.

Favorite.—Very large and smooth, dark red. One of the finest varieties yet introduced. Ripe August 11.

The trial with potted plants showed nothing in their favor, but much may doubtless be attributed to the influence of the wet season. It was difficult to keep the potted plants growing as well as the unpotted plants while in the cold frames, so that when transplanted into the open ground the unpotted plants were the larger. The unpotted plants wilted more than the others, but a continued rain soon after planting revived them, hence it was impossible to detect any difference in growth and time of ripening. Had there been but little rain soon after transplanting, doubtless a difference in earliness would have been noticed.

Seed was saved in 1882 from tomatoes ripening at different dates, the object being to compare the earliness of tomatoes grown from early and late gathered seed. The seed was all sown at the same time and the plants treated alike in all respects. The same number of plants of each was taken and a record kept of the number of ripe tomatoes at different dates upon each plot. Two varieties only were used, the Acme and Perfection.

The tomatoes upon the different plots of each variety commenced ripening at about the same time. A slight difference in time of ripening of the Acme was noted between fruit on plants grown from seed saved August 16 and from seed saved September 11. The difference is, however, by no means marked, and several years will perhaps be required to show any marked results. Perfection shows nothing. One fact may be noted, viz: Plants from early selected seed produced finer fruit than from late selected seed.

ACME, FROM SEED SAVED AUGUST 16, 1882.

Date.	Number of tomatoes.	Remarks.
August 9, 1883		Commencing to ripen.
“ 14, 1883	9	Fine specimens.
“ 17, 1883	19	“
“ 28, 1883	38	“
September 12, 1883	117	Not as fine as at first.
ACME, FROM SEED SAVED AUGUST 25, 1882.		
August 9, 1883		Commencing to ripen.
“ 14, 1883	4	Medium.
“ 17, 1883	9	“
“ 28, 1883	42	“
September 12, 1883	79	“
ACME, FROM SEED SAVED SEPTEMBER 11, 1882.		
August 9, 1883		
“ 14, 1883	1	Medium.
“ 17, 1883	8	“
“ 28, 1883	31	“
September 12, 1883	80	Small.
PERFECTION, FROM SEED SAVED AUGUST 16, 1882.		
August 14, 1883	1	Good.
“ 17, 1883	9	“
“ 28, 1883	29	Fine specimens.
September 12, 1883	68	“
PERFECTION, FROM SEED SAVED AUGUST 25, 1882.		
August 14, 1883	2	Medium.
“ 17, 1883	6	“
“ 28, 1883	33	Fine specimens.
September 12, 1883	61	“
PERFECTION, FROM SEED SAVED SEPTEMBER 11, 1882.		
August 14, 1883	2	Medium.
“ 17, 1883	7	“
“ 28, 1883	43	Small.
September 12, 1883	80	“

BEANS.

Dr. E. L. Sturtevant, of the New York Experiment Station, kindly d nated to the Station the following varieties of beans. No special e periments were undertaken. All the varieties were treated alike, and the fo lowing observations made regarding their growth and maturity:

Dwarf Red Cranberry.—A dwarf bush variety, with numerous small straig pods. Beans small, nearly round. Color, dark red with white eye. Edib August 1. Fully ripe August 25.

Purple Flageolet.—A bush variety, about fifteen inches high. The vines di not make a good growth; the pods were thinly set, and not well filled. Bean oblong; medium sized; color, dark purple with white eye. Edible August 1 Ripe August 25.

Intermediate Horticultural.—A dwarf variety, about one foot in height. Th vines are moderately thrifty and fairly productive. Beans medium size; colo white with streaks of rose color. Edible August 1. Ripe August 25.

Yellow Eyed China.—A vigorous bush bean, growing about sixteen inches high Beans large, white, yellowish brown about the eye. Edible August 5. Rip September 4.

Gallega or Large Refugee.—A bush bean of vigorous habit. Ripe beans dark purple with white spots. Ripe September 11. Number of pods per vin 14. Average number of beans per pod 6.

Pea Bean.—A slender bush bean, of twining habit. Growth very poor ripened unevenly; September 11, only about half ripe. Beans small, globular.

French Emile.—A dwarf bush bean, about ten inches high. Growth ver poor; foliage rusty. Ripe beans purple, mottled with brown. Ripe August 25.

Crystal Wax.—Vines of a slender dwarf habit, but healthy growth and productive. Beans when ripe, small, white. Ready for use August 1. Ripe August 27.

Dwarf Golden Wax.—Plants dwarf, stocky, moderately productive. Beans white; purple about the eye. This one of the best string beans. Edible August 1. Ripe August 25.

Early China.—Known as Red-eyed China, Red China, and by several other names. This is a vigorous growing bush bean, old and well known. Color of ripe beans white, plashed with pink about the eye. August 1, ready for use. Ripe August 28.

Dwarf Black Wax.—A very dwarf bush bean, of moderately good growth and quite productive. Beans small, oval, jet black. Edible August 1. Ripe August 25.

Large Yellow, Six Weeks.—A dwarf vigorous bush bean, with dark green foliage. Pods yellowish green. Beans greenish white. Ready for use August 1. Ripe August 25.

Golden Butter Wax.—Vines dwarf, moderately vigorous, with yellow, semi-transparent pods. Beans small, jet black. Ready for table use August 1. Ripe August 25.

Early Mohawk.—A strong growing bush bean, quite productive, with light green pods. Beans small, oblong, purple, mottled with brown. Edible August 1. Ripe August 25.

Improved Green Flageolet.—Growth poor, ripened unevenly, pods not well filled. Beans small, greenish white. Ripened about September 11.

Turtle Soup.—Growth good, but quite slender in habit, with a tendency to climb. Pods yellow, with purple spots. Beans small, black. Ripe September 11.

Refugee.—A dwarf bush bean, about ten inches high, quite productive. Pods yellow, with dark spots. Beans small, dark purple. Ripe September 11.

Pea Bean (*Navy*).—A bush bean of moderately vigorous growth and quite productive. Beans small, oval, white, with slight markings. Ripe September 11.

Dwarf German Wax.—Vines about eight inches high, of moderately vigorous growth and fairly productive. Pods yellow, semi-transparent. Ripe beans white, with veiny markings. Ready for table use August 1. Ripe August 25.

Early Dun Colored.—A bush bean, growing about twelve inches high; a vigorous grower and quite productive. Ripe beans medium size, dark brown. Ripe September 11.

White Flageolet.—Vines quite vigorous, growing about one foot high. Ripe August 25.

White Scimeter.—A bush bean, growing about ten inches high, quite productive. Ripe bean medium sized, white, with veiny markings. Ripe August 25.

Boston Dwarf Wax.—A dwarf bush bean, fairly productive. Pods yellow. Ripe beans medium sized, dark brown. Ready for use August 1. Ripe August 25.

White Marrow.—A rather slender but prolific bush bean. Ripe beans medium sized, white. Ripe August 25.

White Kidney.—A vigorous growing bush bean, quite productive. Ripe beans white. Ripe September 4.

Best of All.—A free growing bush bean, about one foot high, quite productive. Beans light brown, streaked with red. Ripe September 4.

Red Flageolet.—A moderately productive bush bean, growing about a foot high. Pods yellow. Beans dark red, nearly black. Ripe August 25.

Canadian Wonder.—A strong growing bush bean, about eighteen inches high, quite productive. Pods yellow. Beans dark red. Ripe September 4.

Early Feejee.—A dwarf bush bean, moderately vigorous and quite productive. Pods green. Beans white, varying to white mottled with blue. Ripe August 25.

Red Kidney.—Vines grow about one foot high. Pods yellow. Beans medium sized, red. Ripe August 25.

Ivory Pod Wax.—A slender growing bush bean, not very productive. Pods white, stringless. Beans white, medium size. Ready for use August 1. Ripe August 25.

Black Wax.—A very dwarf bush bean, quite productive. Pods waxy, yellow. Beans small, black. Ready for use August 1. Ripe September 1.

Early Rachel.—A bush bean, growing about fifteen inches high, quite productive. Pods green. Beans medium sized, brown. Ripe August 25.

Dun Cranberry.—A bush variety, growing about one foot high. Pods greenish yellow. Beans medium, light brown. Ripe August 25.

Red Kidney.—A vigorous growing bush bean, height one foot. Pods yellowish green. Beans light red or brown. Ripe August 25.

Red Lima.—A strong growing pole bean, much like the White, except in color. Pods did not fill well. Ready for table use September 11.

Marblehead Champion.—Growth poor, vines rusty, did not run much. Beans medium, light brown. Ripe August 25.

White Cranberry.—Growth poor, climbing but little, unproductive. Beans medium, globular, white.

Scarlet Runner.—A vigorous growing pole bean, quite productive. Ripe beans black, mottled with purple.

Horticultural.—Runs but little, moderately productive. Beans large, dun colored. Ripe September 11.

Kentucky Wonder.—A free growing pole bean, although not running freely. Edible August 1. Ripe September 4.

Concord.—A pole bean, but not very vigorous, climbing but little. Beans medium size, white, with light brown around the eye. Ripe September 11.

Transylvania Butter.—Climbs but very little, growth poor, not productive. Beans bluish color. Ripe September 11.

Case Knife.—A moderately productive pole bean. Beans, medium, flat, kidney shaped, white. Ripe September 11.

Marshall.—A free growing, productive pole bean. Beans medium size, dun color, streaked with yellow. Ready for use August 25.

Pale Dun Runner.—A productive, free growing pole bean. Beans globular, small, color brown, yellow around the eye. Ready for use September 4.

Giant Red Wax.—A productive pole bean. Beans medium size, oblong color, dark red. Edible August 25.

Mottled Cranberry.—Growth poor, almost runnerless. Beans, oblong, medium size, red and white. Ripe September 11.

French Yard Long.—An unproductive pole bean, at least in this climate. Pods one to two feet long, but not well filled. Beans small, oblong; color dark brown. Ripe September 11.

Mont D' Or.—A bush bean growing about one foot high; has but little tendency to climb; quite productive. Ripe beans medium size; color, dark brown. Ripe August 25.

Small White Lima.—A small, early and quite productive Lima bean. Ripe September 11.

Indian Chief.—A pole bean, although climbing but liittle; pods yellow, not well filled. Beans medium size; color bluish black. Ripe September 11.

Tree Bean.—A vigorous growing, productive variety. The pods are not borne up from the ground, hence the beans are much iujured in wet weather. Ripe September 11.

CABBAGES.

The plants were grown mainly for a late crop, to follow early potatoes, so that two crops might be raised from the same ground in one season. Owing to the dry weather the crop was almost a total failure, except one-quarter of an acre which was planted for a second early crop. The cultivation was done entirely by horse implements, thus reducing the cost to a minimum. The actual expense, as shown by the records, did not exceed one cent per head.

ONIONS.

The amount of ground occupied with onions was three-quarters of an acre. This was thoroughly enriched with well decomposed stable manure. The soil was well prepared, and the seed sown as early as the ground was in a condition to work. The frequent and heavy rains early in the season were favorable to the growth of weeds, and made the cultivation difficult and more expensive than it would otherwise have been. All of the work was done with the hand cultivator and by hand weeding. The crop made a good growth in the early part of the season, but the drouth which came later checked this growth, and reduced the yield by nearly one-half. The product was about 275 bushels, and the crop cost nearly 30 cents per bushel.

The following table shows the amount of labor expended, together with the cost of seed and manure:

Dr.	
Cost of seed	$10 00
Cost of manure	10 00
Men's labor, preparation of ground, sowing and weeding, gathering and storing, 29.7 days, at $1.50	44 55
Boy's labor, weeding, 20 days, at 75c	15 00
	$79 55
Cr.	
By 275 bushels of onions, at 60c	$165 00
By balance	$85 45

A small amount of team work is not charged, being more than overbalanced by value of manure left in the ground. The variety most largely grown was the Early Yellow Danvers. The Red Weathersfield, Early Red, Silverskin, and several other varieties were grown in less quantity.

OTHER VEGETABLES.

Carrots, beets, parsnips, and vegetable oysters were grown in a similar manner. About one-sixth of an acre was devoted to each crop. The work was done entirely with a hand cultivator, and by hand weeding. The expense of raising the crops averaged about ten cents per bushel.

REPORT ON FRUITS.

In the fruit garden of the University, we are cultivating the apple, pear, plum, peach, quince and grape. There are also plantations of strawberries, raspberries, blackberries, gooseberries, and currants.

APPLES.

The apple orchard contains 198 trees and covers about five acres. Many of the trees were killed or injured by the severe winter of two years ago. Vacancies were filled last spring, every dead or seriously injured tree being removed and another substituted in its place. Some of the older trees that remain will be removed next spring on account of their unthrifty condition. The ground between the rows of apple trees is occupied with strawberries, raspberries and blackberries, and is all under cultivation.

PEARS.

The pear orchard includes both standard and drawf trees, 330 in all, covering about one and one-half acres. This has suffered to some extent from blight, and some of the trees appeared to be injured by the severe summer drouth. Some vacancies were filled last spring with new and carefully selected varieties. Others remain that will be filled next spring. The orchard has been under cultivation the past season, the land being occupied with potatoes and peas. The dwarf trees are in fairly good condition, but the standards have never done well. Judging from appearances they were inferior trees when planted. They certainly give no promise for the future.

The dwarfs have nearly reached the bearing age, and may reasonably be expected to yield fair crops in the near future.

Tests are being made to show the effect of different methods of cultivation, pruning, etc.

CHERRIES.

The cherry orchard contains about 80 trees, and covers about one-half an acre of ground. The number of varieties is somewhat limited, but nearly all of the trees are in excellent condition. The land is kept cultivated, the spaces between the trees being occupied with currants and gooseberry bushes. All the fruit buds were killed and some of the trees injured the past winter.

QUINCES.

The quince orchard contains 68 bushes, and covers about one-fifth of an acre. Some of the bushes have been attacked by blight, and a few have been injured by borers. They made an excellent growth the past season, and nothing in the whole garden looked more promising last fall The winter proved too severe. All were killed to the ground.

GRAPES.

The vineyard contains 368 vines, and covers nearly one-third of an acre. About 150 of the vines are of bearing age. Two hundred one-year-old vines, consisting of about 60 varieties, were planted last spring. These vines were donated by Prof. S. M. Tracy, of the Missouri State University. The collection embraces the following sorts:

Agawam, Alvey, Amber, Amber Juice, Black Eagle, Black Hawk, Blood's Black, Brighton, Cambridge, Clinton, Cottage, Creveling, Delaware, Duchess, Early York, Eldorado, Elvira, Elvira Seedling, Goethe, Golden Clinton, Golden Delaware, Grimes' Golden, Hartford, Highland, Humboldt, Iona, Isabella, Ives' Seedling, Lady, Lady Washington, Lindley, Marion, Massasoit, Merrimac, Mi. Reisling, Moore's Early, Naomi, Norton's Virginia, Othello, Pearl, Perkins, Prentiss, Ricket's No. 141, Roger's No. 2, Rulander, Salem, Taylor's Bullet, Taylor's Seedling, Telegarph, Transparent, Vergennes, Walter, Worden's Seedling. Nearly all of the grapes were injured by the severe frosts of the past winter.

STRAWBERRIES.

The strawberry plantations, both new and old, cover a little more than one and one-half acres of ground. About one-fourth of these were planted in the spring of 1882. They were injured somewhat by the dry weather of the succeeding summer, but were carefully protected the following winter, and bore a fair crop the past season. Strawberries being a light crop generally in this vicinity, the price ruled high. The plants set last spring, something over an acre, are in good condition, although the dry weather checked their growth materially. One plantation is devoted entirely to new varieties for the sake of comparison and study.

It contains the following sorts: Bright Ida, Maggie, Primo, Piper's Seedling, Woodward's No. 1, Early Canada, Gypsy, Orient, Satin Gloss, Columbus, Wilson's, Norman, Photo, Oliver Goldsmith, Finch's Prolific, Sterling, Duncan, Warren, Green Prolific, Capt. Jack, Crescent, Miner's Prolific, Kentucky, Longfellow, Mt. Vernon, Seth Boyden, Bidwell, Marvin, New Dominion, Sharpless, Cumberland Triumph, Hart's Minnesota, Chas. Downing, Windsor Chief, Huddleston's Favorite, Monarch, Endicott's Seedling, Seedling of Kentucky, Idaline, Big Bob, James Vick, Jersey Queen, Manchester, Daniel Boone, Mrs. Garfield, Prince of Berries, Atlantic, Crawford's No. 6, Cornelia, Nigh's Superb, and several others. These will be fruited the present season, and careful notes of their respective qualities are being made.

The plants were set in spring, in rows three and one-half feet apart. They were well cultivated and the runners allowed to take root. In early winter, before our severe frosts, the beds were covered over with a coating of straw. Two year's experience here in Central Ohio has proved that careful winter protection is one of the essential requisites of success in strawberry culture. An account of the cost of the plants, and every hour of labor, is carefully kept. By this means we shall be able to tell next season just what our strawberries cost us per quart.

RASPBERRIES.

The raspberry plantations cover a little more than two and one-half acres of ground. They consist of both red and black varieties. Of the red we have the following: Turner, Brandywine, Cuthbert, Crimson Beauty, Hansell, Shaffer's Colossal, Lost Rubies, Superb, Florence, Hopkins, Highland Hardy, Marlboro, Montclair, Michigan Early Red, Baumforth's Seedling and others. Of the black: Mammoth Cluster, Gregg, Miami, Tyler, Souhegan, etc. The method of cultivation is simply to keep the ground free from weeds, and to remove all superfluous suckers or stolens. No stakes are used. The bushes are made to support themselves by systematic pruning. The crop of the past summer was not a full one, owing to the fact that many of the bushes were injured by the cold weather of the previous winter. The plantations, as a whole, are now fair condition, and give promise of a good crop this year. A few varietieties winter-killed badly.

BLACKBERRIES.

Only a small portion of the fruit garden is devoted to blackberries, but we expect to extend the plantation and increase the list of varieties next spring. Those cultivated at present were badly injured by winter-killing.

CURRANTS AND GOOSEBERRIS.

These occupy the ground between the rows of trees in the cherry orchard. They have been very thoroughly cultivated, and the effect is seen in the increased size and improved quality of the fruit. The crop of the past summer was an excellent one, and brought fair prices. The varieties cultivated are mainly old standard sorts. Owing to the lack of time and means but little attention has been given to new varieties, although a few, like Fay's Prolific, have been planted.

SEED TESTS.

BY W. S. DEVOL.

The Station has continued the work begun last year of testing the vitality of seeds. Most attention has been given to Indian corn, as that is such an important crop in the agricultural interests of the State, and so much depends in the successful culture of this cereal upon having good reliable seeds to being with. In order to conveniently reach as many farmers as possible, the following circular letter was prepared and sent during February, to one or more of the newspapers in each county of the State:

WILL YOUR SEED CORN GROW?

The planting of poor seed is a source of thousands of dollars annual loss. All seeds are apt to lose their vitality from improper curing and various other causes, and when planted fail to grow. Seed corn is especially apt to be injured.

In order to help guard against the loss from planting poor seed the Ohio Agricultural Experiment Station has arranged to test, free of charge, all seeds sent for that purpose.

In selecting samples care should be taken to secure a fair average of the whole stock to be used. The corn should be taken, one kernel from the middle, one from the butt, and one from the tip of each of one hundred ears, the tip, middle and butt kernels kept separate. The package should be plainly marked with the name of the sender. A letter should be sent at the same time stating as many facts as possible regarding the variety sent, the particular crop of which it is a sample, time of husking, *manner of keeping*, and other points of importance.

Inquiries directed to the Station regarding seeds, seed testing, etc., will receive prompt attention and be answered as far as possible. All communications and packages should be addressed, EXPERIMENT STATION, COLUMBUS, O. Results of tests will be forwarded to the sender as soon as completed.

The circular was very generally published by the papers receiving it, and copied by others. Samples were sent for testing by one hundred and thirty-eight individuals, representing nearly sixty counties. Over twenty farmers of Frankling county, where they are better acquainted with the purpose and workings of the Station than in any other part of the State, sent samples of their seed corn for testing. Five hundred and forty-seven samples (counting the grains taken from tip, middle and butt of the same ear, each a separate sample) were received, which, with those tested for the Station, make a total of five hundred and seventy-five samples of seed corn tested this year (since January 1, 1884).

In the first of the following tables is given the tests made in 1883, including the twenty four published in the last report of the Station. Ninety-six tests of corn germination were made in 1883, as shown in Table I, the average that germinated being 69.3 per cent.

Of the samples taken from the *tips* of ears an average of 70.3 per cent. germinated; of those from the *middles* of ears an average of only 58.7 per cent. germinated; and of those from the *butts* of ears an average of 76 3 per cent. germinated. Most of the samples tested in 1883, however, were taken from all parts of the ears, or the part they were taken from was not specified. Of these an aver of 70.2 per cent. germinated.

Table II gives the details of tests of corn for 1884. Of the five hundred and eighty tests an average of 78.8 per cent. germinated. In a majority of cases the samples were sent as directed in the circular. Of those from the *tips* of ears an average of 76.1 per cent. germinated; of those from the *middles* of ears 74.2 per cent. germinated; of those frôm the *butts* of ears 84 per cent. germinated; and of those from all parts of ears, or where no part was stated, 82.2 per cent. germinated.

The radicle from the tip kernels is almost invariably weaker than from the middle or butt kernels. The root from the middle kernels sends out its root hairs sooner than that of the butt kernels. The butt kernels send out two lateral rootlets, nearly as strong as the central root and almost simultaneeusly with it, while the lateral roots are weaker in the middle kernels and slower to start.

The most marked comparison is shown between corn kept in the crib and that cured in the fall before cribbing, either by means of artificial heat or by hanging the ears up, or otherwise thoroughly drying them. The following is a comparison of the average per cent. germinated of all samples known to have been kept in a crib in one case, as is the general custom, or dried in some manner, in the other:

PER CENT. GERMINATED.

	Tips.	Middles.	Butts.	All others.	Total average.
From crib	56.7	52.4	80.6	65.4	63.3
Carefully dried	88.9	98.3	92.3	92.3	93.1

It will be seen that with corn from the crib a greater per cent. germinated from the butts than from the tips, while of those from the middles of the ears a still lower per cent. germinated than from tips. On the other hand, the largest per cent. germinated was from the middles of ears carefully cured, the butts being next and the tips the lowest average.

As the greater part of the ear would be called the middle part, or is under the same conditions as to degree of dryness or curing, the per cent. of germination given for the middles of ears more nearly represents the average for the whole ear than that obtained by taking the average of the tips, middles, and butts. Thus if the kernels from the whole ear were to be planted an average of little more than 62 per cent. of that from the crib could be expected to grow; but of that carefully cured, an average of almost 94 per cent. might reasonably be expected to germinate.

Corn that will germinate sufficiently well in mid-winter for planting, may not be fit for seed when planting time arrives if it is left exposed to the severity, and especially the rapid *variations* of temperature that we are liable to have in late winter each year.

This is evident from tests made of corn taken from a crib at different times. Thus, tests Nos. 202, 203, and 204 were made from corn taken from the crib and tested January 21st; Nos. 283, 284, and 285 were taken from the same lot of corn and tested February 26th; Nos. 839, 840, and 841 were likewise from the same crib, selected and tested April 24th. For comparison, the results of these tests are given as follows:

PER CENT. GERMINATED.

	Tips.	Middles.	Butts.	Average.
Selected January 21st	78.0	64.0	78.0	73.3
Selected February 26th	33.3	14.6	44.4	30.8
Selected April 24th	32.0	8.0	40.0	26.7

It will be seen that there was a much greater loss of vitality during the period between the first and second set of tests, than between the second and third, although the time of the latter is almost double the former. This may be explained by, and is what should be expected from, the greater range and more rapid changes of temperature during the first interval between the tests.

Numbers 63, 64, and 70 in Table I, and 732, 790, 791, and 792 in Table II were Flint varieties; all others were Dents.

The seeds were germinated in the seed tester described on page 114 of the report of the Station for 1882.

As soon as the radicle had burst through the testa, or seed coat, the seed was counted "germinated." From the per cent. of kernels that grew and formed plants in the field last year we are convinced that nearly all that burst through the testa without splitting it lengthwise of the kernel, and appear vigorous, will grow when planted. There were a few samples, however, in which the radicle of an occasional kernel, soon after coming through, turned brown and died. In such instances the kernel was not counted as germinated.

The numbers in the column marked "Test number" are those by which the test is kept and may be referred to in the Station records. The column marked "Color" has reference to the color of the grain; "Y" signifies that the grain is *yellow*, "W" that it is *white*, "R" that it is *red*, and "S" that it is *striped* or *spotted*. In the column marked "Tested for" is given the name and address of the person or firm sending the seeds to be tested. In the next column is given the number of hours from the time the seeds were put in the tester until the first germinated. Of those sprouted, one-half of them sprouted in the number of hours from the time the test was begun, given in the next column. In the column "Last seed sprouted" is given the number of days from the time the seeds were put in until the last one that would sprout had done so. In the next column is given the per cent. or number of seeds in one hundred that sprouted. "Number of ears" column gives the number from which the sample was taken. In the next column "T" means that the sample was from the *tips* of the ears, "M" from the *middles* of the ears, "B" from the *butts* of the ears. In the column for remarks the manner in which the corn was kept is stated in every instance in which it could be ascertained. Thus, "From crib" means that the corn from which the sample was taken had been kept in an ordinary crib; "Hung up in fall" means the ears were hung up to dry at the time of husking, usually remaining all winter.

TABLE I.—SEED TESTS, 1883—INDIAN CORN.

Test number.	Variety.	Color.	Tested for—	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears.	Part of ear.	Remarks.	Test number.
1	Illinois White	W.	W. Brotherton, Ohio State University	42	48	3	8	5	T.	From Crib	1
2	"	W.	same	42	42	6	28	5	M.		2
3	"	W.	same	42	60	5	76	5	B.		3
4	Leaming	Y.	same	38	42	4	95	20	T.	From crib	4
5	"	Y.	same	38	42	4	85	20	M.		5
6	"	Y.	same	38	42	4	90	20	B.		6
7	Illinois White	W.	same	38	48	5	40	5	T.	From crib	7
8	"	W.	same	38	42	8	40	5	M.		8
9	"	W.	same	38	42	4	20	5	B.		9
10	Leaming	Y.	same	42	84	7	80	20	T.	From crib	10
11	"	Y.	same	42	96	8	65	20	M.		11
12	"	Y.	same	38	96	8	95	20	B.		12
13	"	Y.	J. S. Roloson, Columbus, Ohio	42	112	7	88			Hung up in the fall	13
14	"	Y.	same	36	72	5	36			From middle of bin	14
15	Early Marblehead Sweet	R.	same	34	42	5	100				15
16	Leaming	Y.	same	42	96	7	60			From top of bin	16
17	Evergreen Sweet	W.	same	36	40	4	32				17
25½	Cuzco	W.	Ohio Experiment Station	48	72	6	100			Thoroughly dried in fall	25½
26	Clarke County Champion	W.	J. A. Buel & Co., Springfield, Ohio	40	48	9	30				26
27	Leaming	Y.	same	40	48	9	75				27
28	"	Y.	W. S. Haverfield, Cadiz, Ohio	38	38	2	20				28
29	"	Y.	same	38	40	7	36				29
30	Wysor's Ey. Shoepeg	W.	From "Rural New Yorker"	40	40	6	70				30
31	Leaming	Y.	W. Brotherton	18	58	8	67	40	T.	From crib.	31
32	"	Y.	same	18	60	10	58	40	M.		32
33	"	Y.	same	20	58	10	83	40	B.		33
34	White Flint	W.	Thomas Palmer, Chippewa Lake, Ohio	40	96	8	80	25			34
35	"	W.	same	18	40	8	84	25			35
36	Unknown	Y.	same	36	100	10	84	25			36
37	"	Y.	same	18	24	6	68	25			37
38	Leaming	Y.	J. F. Sacket, Lewis Centre, Ohio	36	72	10	75				38
39	"	Y.	same	40	76	12	60				39
40	"	Y.	same	36	44	10	65				40
41	"	Y.	Chas. Searle, Berkshire, Del. County, Ohio.	144	144	6	5	1	T.	In shock all winter.	41
42	"	Y.	same					1	M.		42
43	"	Y.	same	94	94	8	10	1	B.		43

TABLE I.—Continued.

Test number.	Variety.	Color.	Tested for.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears.	Part of ear.	Remarks.	Test number.
44	Leaming	Y.	Chas. Searle, Berkshire, Del. county, Ohio.	22	60	5	100	1	T.	Hung up in fall	44
45	"	Y.	same	30	60	7	100	1	M.		45
46	"	Y.	same	30	60	6	88	1	B.		46
47	White Curtis	W.	same	24	24	8	75	1			47
48	Yellow Curtis	Y.	same	24	38	3	100	1	T.		48
49	"	Y.	same	22	26	8	95	1	M.		49
50	"	Y.	same	36	44	7	95	1	B.		50
51	Red Curtis	R.	same	36	48	6	55	1			51
52	Leaming	Y.	G. N. Sprague, Berlin Heights, Ohio	20	24	6	40				52
53	"	Y.	same	20	24	6	33				53
55	Unknown	S.	J. M. Wilson, Columbus, Ohio	144	144	6	5				55
56	"	S.	same		48	10	55				56
57	"	S.	same		56	13	38				57
58	Weikert's Prolific	Y.	J. Weikert, Greenford, Ohio		40	7	56		M.		58
59	Yellow Dent	Y.	S. S. Devol, Marietta, Ohio	38	45	10	85		T.		59
60	"	Y.	same	44	56	5	55		M.		60
61	"	Y.	same	40	56	7	80		B.		61
63	King Philip	R.	A. W. Livingston's Sons, Columbus, Ohio.	36	44	9	70				63
64	"	R.	same	36	40	6	100				64
65	Kansas Yellow Field	Y.	same	24	44	9	68				65
66	Yellow Field	Y.	same	24	41	9	68				66
67	Livingston's Evergreen Sweet	W.	same	30	36	9	52				67
68	Stowell's Evergreen Sweet	W.	same	36	36	9	50	1			68
69	Late Mammoth Sweet	W.	same	36	45	9	85	4			69
70	Longfellow	Y.	same	30	44	11	84				70
71	Leaming	Y.	same	22	38	11	62				71
72	Hoosier White	W.	same	24	40	11	70				72
73	Canada Yellow	Y.	same	36	38	5	100				73
76	Leaming	Y.	D. L. Gaskell, Greenville, Ohio	20	50	11	40				76
77	"	Y.	W. Brotherton	24	48	5	50	10	T.	From crib	77
78	"	Y.	same	24	50	10	40	10	M.		77
79	"	Y.	same	24	50	11	73	10	B.		79
80	Unknown	Y.	John Rice & Son, Attica, Ohio	24	48	8	28				80
81	"	Y.	same	24	46	8	66				81
82	White Cap Dent	Y.	A. C. Pepoon, Painesville, Ohio	30	43	11	66				82
83	Leaming	Y.	G. N. Sprague, Berlin Heights, Ohio	36	45	8	88				83

87	Mammoth Clarage	Y.	Joseph Haines, Paulding Centre	22	50	8	23				87
89	Leaming	Y.	Ohio Agricultural Experiment Station	24	38	6	86	50	T.		89
90	"	Y.	same	24	40	6	98	50	M.		90
91	"	Y.	same	24	38	6	94	50	B.		91
92	"	Y.	W. Brotherton, O. S. U. Farm Supt	24	41	5	98	40	T.		92
93	"	Y.	same	24	50	7	88	40	M.		93
94	"	Y.	same	28	38	7	100	40	B.		94
95	Queen of the Prairie	Y.	same	30	41	7	100	20	T.		95
96	" "	Y.	same	24	50	5	55	20	M.		96
97	" "	Y.	same	30	41	5	70	20	B.		97
98	Chester County Mammoth	Y.	Slater Brown, Barton, Belmont county, O.	24	52	7	94	6	B.		98
99	Robson	Y.	same	30	42	5	18	4	M.		99
100	Russell	Y.	same	24	48	6	92	1			100
101	Unknown	Y.	same	24	48	7	90	12			101
102	Egyptian Sweet	W.	same	26	52	6	96	6			102
104	Unknown	Y.	N. Woodruff, Black Lick, Ohio	26	54	4	87	100			104
105	"	Y.	S. J. Galloway, Montgomery, O.	28	56	7	77				105
106	"	W.	Geo. P. Green, Rock Bridge, Ohio	20		2	48				106
107	Clinton	Y.	same	36		3	14				107
108	Leaming	Y.	S. H. Ellis, Springboro, Ohio	22		2	96				108
109	Newton	Y.	Newton Berry, Hunter, Belmont county, O	26		2	100				109
110	Unknown	Y.	S. J. Galloway, Montgomery, Ohio	21		5	98				110
111	Leaming	Y.	J. F. Thompson, Layman, Ohio	30	68	4	100				111

TABLE II.—SEED TESTS, 1884.—INDIAN CORN.

Test number.	Variety.	Color.	Tested for.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	No. of ears.	Part of ear.	Remarks.	Test number.
197	Leaming	Y.	W. Brotherton, O. S. U. Farm Supt.	......	......	9	88	50	T.	From ordinary crib	197
198	"	Y.	same	......	......	2	68	50	M.		198
199	"	Y.	same	......	......	7	86	50	B.		199
200	"	Y.	same	......	......	7	80	50	B.	......	200
201	Unknown	W.	W. F. Brown, Oxford, O	......	......	5	77	......	......	......	201
202	Leaming	Y.	W. Brotherton	......	......	9	78	50	T.	From crib	202
203	"	Y.	same	......	......	5	64	50	M.		203
204	"	Y.	same	......	......	9	78	50	B.		204
207	Golden Yellow	Y.	John Lavely, Galloway, O.	......	......	10	89.3	28	M.	From crib	207
208	Clarage (mixed)	Y.	same	......	......	3	64.3	14	M.	"	208
209	"	Y.	same	......	......	10	65	20	M.	From shock	209
210	Leaming	Y.	W. Brotherton	......	......	3	70	50	T.	From crib	210
211	"	Y.	same	......	......	3	40	50	M.		211
212	"	Y.	same	......	......	9	70	50	B.		212
213*	Egyptian White	W.	Ohio Agricultural Experiment Station	30	......	3	100	2	......	......	*213
214	Boone County White	W.	same	30	......	4	100	3	......	......	214
215	Pride of the North	W.	same	36	......	3	92	3	......	......	215
216	Pearl White	W.	same	30	......	3	100	1	......	......	216
217	Golden Yellow	Y.	same	39	......	4	100	8	......	......	217
218	Leaming	Y.	same	30	......	3	100	3	......	......	218
219	"	Y.	same	36	......	3	100	3	......	......	219
220	"	Y.	same	34	......	3	96	3	......	......	220
221	"	Y.	same	30	......	3	100	3	......	......	221
222	"	Y.	same	26	......	3	100	2	......	......	222
223	"	Y.	same	29	......	3	100	6	......	......	223
224	Gourdseed cross on Leaming	Y.	same	26	......	3	100	2	......	......	224
225	Leaming cross on Gourdseed	Y.	same	26	......	3	100	2	......	......	225
226	Gourdseed	Y.	same	26	......	3	100	2	......	......	226
227	Bounds	Y.	same	29	......	8	100	3	......	......	227
228	"	Y.	same	34	......	8	96	8	......	......	228
229	Unknown	W.	same	29	......	3	96	2	......	......	229
230	"	W.	L. N. Bonham, Oxford, O	82	......	6	82	8	......	......	230
231	Leaming	Y.	Daniel Boyd, Plain City, O	30	......	7	100	50	......	Dried in fall	231
232	"	Y.	Jas. Boyd, Plain City, O	30	......	5	86	50	......	From shock, Nov., 1883	232
233	Clarage	Y.	same	30	......	8	100	50	......	From stalk, Sept., 1883	233
234	"	Y.	same	30	......	3	80	50	......	From shock, Jan., 1884	234

244	Unknown	Y.	Emmett Mix, Avenue, O	28	48	6	68	50			244
245	"	Y.	same	27	48	3	81			Three years old; from crib	245
246	"	Y.	same	25	48	6	71.3	75			246
247	"	Y.	same	28	48	2	43.7				247
248	"	Y.	W. Hunter, Columbus	86	48	3	100	1			248
249	"	Y.	same	96	96	4	2	1		Cribbed in the fall	249
250	Clarago	Y.	Frank Latham, Plain City, O	82	46	6	98			" "	250
251	Unknown	Y.	Jacob Bush, Parretts, O	28	46	3	90	100		Selected and dried in fall	251
252	Farmers' Favorite	Y.	L. Erwin Parrett, Washington C. H., O	26	46	2	100	1		" "	252
253	Unknown	Y.	same	29	46	3	100	1		" "	253
254	De Witt	W.	Anderson De Witt, Washington C. H., O	29	46	6	69	1		Dried in the fall	254
255	Clarage, Improved	Y.	same	29	46	4	99	1		" "	255
256	Leaming	Y.	W. Brotherton	40	48	3	72	100	T.	Selected seed; from crib	256
257	"	Y.	same	38	48	7	38.5	96	M.		257
258	"	Y.	same	39	52	7	80	100	B.		258
259	Unknown	W.	L. N. Bonham, Oxford, O	40	48	5	52	100	T.		259
260	"	W.	same	37	48	5	54	100	M.		260
261	"	W.	same	37	48	6	74	100	B.		261
276	Leaming	Y.	W. T. Reese, Reeses, O	38	46	5	100	100	T.		276
277	"	Y.	same	38	46	6	93	100	M.		277
278	"	Y.	same	40	46	6	93	100	B.		278
279	Unknown	Y.	J. K. Danferty, Alton, O	37	47	6	95				279
280	Vickers	Y.	Jas. Scott, Adams' Mills, O	29	46	2	98	100		Selected in fall; kept in loft	280
281	Hathaway	Y.	same	30	46	3	95	50		Selected in the fall	281
282	Leaming	Y.	same	30	46	5	90	50		" "	282
283	"	Y.	W. Brotherton	31	47	4	33.3	48	T.	From ordinary crib	283
284	"	Y.	same	29	47	5	14.6	48	M.		284
285	"	Y.	same	30	50	5	44.4	48	B.		285
286	"	Y.	Robt. A. Calvert, Portsmouth, O	25	47	3	79	100	T.		286
287	"	Y.	same	25	47	7	61	100	M.		287
288	"	Y.	same	29	47	4	72	100	B.		288
289	Moore	Y.	Clayton L. Dickey, Central College, O	25	47	5	41	100	T.		289
290	"	Y.	same	25	47	7	41	100	M.		290
291	"	Y.	same	24	47	5	55	100	B.		291
292	Curtis	Y.	H. W. Chamberlain, Delaware, O	25	47	5	52	100	T.		292
293	"	Y.	same	24	47	5	76	100	M.		293
294	"	Y.	same	24	47	5	90	100	B.		294
295	Evergreen (sweet)	W.	W. J. Green, O. S. University	29	48	4	90				295
296	Unknown	W.	John C. Coon, Ashville, O	30	48	5	78	100	T.	Kept in rail bin	296
297	"	W.	same	31	48	3	77	100	M.		297
298	"	W.	same	31	48	5	95	100	B.		298
299	Common White	W.	Jos. Leib, Lyndon, O	28	48	5	96	100	T.	Kept in lath crib	299
300	"	W.	same	27	48	4	100	94	M.		300
301	"	W.	same	31	48	5	100	100	B.		301
308	Unknown	Y.	J. Wetherell, Camp Chase, O	29	43	3	99	100		Selected in fall	308
309	Early Wilson and Clarage	Y.	Seeds & Scott, Columbus, O	36	60	5	63	34	T.	From the crib	309
310	" "	Y.	same	29	45	3	60	100	M.		310
311	" "	Y.	same	40	60	5	69	34	B.		311
312	Farmers' Favorite	Y.	S. E. Williamson, Hooker's Station, O	29	46	3	82	100	T.	Dried in fall	312
313	"	Y.	same	29	46	8	84	100	M.		313
314	"	Y.	same	30	46	3	99	100	B.		314

* Nos. 213 to 229, inclusive, were from specimen ears sent by several persons for the Station corn collection.

TABLE II.—Continued.

Test number.	Variety.	Color.	Tested for.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears.	Part of ear.	Remarks.	Test number.
315	Leaming	Y.	W. S. Dilatush, Lebanon, Ohio	33	46	6	89	100	T.		315
316	“	Y.	same	33	46	3	94	100	M.		316
317	“	Y.	same	34	46	6	93	100	B.		317
318	Biddle	Y.	J. D. Newcomer, Wauseon, Ohio	29	46	5	39	100	T.	Kept over granary	318
319	“	Y.	same	35	50	5	8	100	M.		319
320	“	Y.	same	34	46	3	80	100	B.		320
321	Leaming	Y.	A. Branstetter, Wooster, Ohio	27	46	3	88	100	T.		321
322	“	Y.	same	27	46	5	83	100	M.		322
323	“	Y.	same	27	46	5	95	100	B.		323
324	McGinnis	Y.	W. Brown, Mechanicsburg, Ohio	35	47	3	56	100	T.	Selected in fall, kept in cabin loft.	324
325	“	Y.	same	35	48	4	30	100	M.		325
326	“	Y.	same	33	47	5	74	100	B.		326
329	Leaming	Y.	A. W. Livingston's Sons, Columbus, Ohio	21	48	2	90	6			329
330	Unknown	Y.	C. Mundhenk, Pyrmont, Ohio	30	47	4	99	100	T.	Dried by kitchen fire	330
331	“	Y.	same		47	2	100	100	M.		331
332	“	Y.	same		47	2	100	100	B.		332
333	Leaming	Y.	Silas C. Gundy, Basil, Ohio	33	43	4	35	100	T.	From large crib.	333
334	“	Y.	same	32	43	2	18	100	M.		334
335	“	Y.	same	34	43	4	47	100	B.		335
336	McGinnis	Y.	J. D. Rudasil, Rushsylvania, Ohio	34	43	4	18			From sack, shelled	336
337	Pride of the North	Y.	same	33	44	6	93				337
338	Common Yellow	Y.	T. J. Porter, New Antioch, Ohio	30	44	3	84.4	100	T.	Dried by stove, and barreled.	338
339	“	Y.	same	30	44	3	93.3	100	M.		339
340	“	Y.	same	31	44	3	84.4	100	B.		340
341	Leaming	Y.	C. W. Oakes, Little Hocking, Ohio	30	44	5	98	100	T.	From crib	341
342	“	Y.	same	29	44	3	92	100	M.		342
343	“	Y.	same	30	44	3	89	100	B.		343
344	“	Y.	D. Pence, Pleasantville, Ohio	29	44	3	73.4	100	T.		344
345	“	Y.	same	29	45	4	43	100	M.		345
346	“	Y.	same	29	45	3	71	100	B.		346
347	Unknown	S.	P. K. McGrone, Texas, Ohio	33	45	6	82	100	T.	Kept in dwelling	347
348	“	S.	same	32	45	3	88	100	M.		348
349	“	S.	same	30	48	3	80	100	B.		349
350	“	W.	J. Q. Baker, Lebanon, Ohio	36	48	5	88	100	M.	From center of crib	350
351	“	W.	same	29	43	4	99	100	M.	Selected ears	351
352	“	Y.	Jas. H. Smith, Lancaster, Ohio	26	43	2	99	100	T.	Kept in cabin loft	352
353	“	Y.	same	26	43	2	99	100	M.		353
354	“	Y.	same	26	43	3	99	100	B.		354

355	Common Yellow	Y.	Geo. E. Scott, Mt. Pleasant, O.	27	43	5	84	10	......	From crib	355
356	Common Cuppy	Y.	same	27	43	4	96	20	......	From loft	356
357	Leaming	Y.	same	28	43	4	10	1	......	Selected	357
358	Mixed	Y.	same	25	43	3	85	12	......	Dried in warm room	358
359	Unknown	W.	Wm. Cullan, Wren, O.	29	43	4	95	......	T.	Dried in house near fire	359
360	"	W.	same	27	43	4	91	......	M.		360
361	"	W.	same	28	43	3	91	......	B.		361
362	Common Yellow	Y.	Geo. M. Martin, Bloomville, O.	......	45	3	96.7	......	T.	Selected in the fall	362
363	"	Y.	same	......	45	3	100	......	M.		363
364	"	Y.	same	......	45	3	100	......	B.		364
365	Zimmer	W.	Frank M. Kraner, Pickerington, O.	......	45	3	92	50	T.	......	365
366	"	W.	same	......	45	3	96	50	M.	......	366
367	"	W.	same	......	45	3	100	50	B.	......	367
368	Curtis	Y.	James F. Sackett, Lewis Centre, O.	......	45	5	95	100	T.	Dried by fire	368
369	"	Y.	same	28	42	3	93	100	M.		369
370	"	Y.	same	31	42	3	87	100	B.		370
371	Leaming	Y.	same	30	41	3	95	100	T.	Dried by a fire in the fall	371
372	"	Y.	same	29	41	4	98	100	M.		372
373	"	Y.	same	31	41	3	98	100	B.		373
374	Unknown	W.	L. Gillilan & Son, Jackson, O.	31	41	3	97	100	T.	From a lath crib	374
375	"	W.	same	24	50	2	96	100	M.		375
376	"	W.	same	26	50	2	100	100	B.		376
377	Leaming	Y.	A. J. Thompson, Oregonia, O.	24	59	3	80	100	T.	From a pile in a large bin	377
378	"	Y.	same	25	27	3	68	100	M.		378
379	"	Y.	same	26	46	4	80	100	B.		379
380	"	Y.	S. G. Walker, Emerson, O.	26	27	3	84	50	T.	Kept in a loft	380
381	"	Y.	same	28	46	4	86	60	M.		381
382	"	Y.	same	25	46	2	96	50	B.		382
383	Unknown	Y.	D. H. Ormsby, Riota, O.	24	44	3	93	100	T.	Hung up by the husks in October	383
384	"	Y.	same	25	44	2	100	100	M.		384
385	"	Y.	same	26	44	3	99	100	B.		385
386	Common Yellow	Y.	O. F. & F. M. Sanford, Rosedale, O.	25	44	3	96	100	T.	½ dried and ½ from crib	386
387	"	Y.	same	25	44	3	93	100	M.		387
388	"	Y.	same	26	42	3	97	100	B.		388
389	Leaming	Y.	Fred. O. Smith, Norwalk, O.	28	42	3	92	25	T.	From the crib	389
390	"	Y.	same	26	42	3	84	25	M.		390
391	"	Y.	same	27	42	3	88	25	B.		391
392	Bloody Butcher	S.	E. R. Culver, Poe, O.	27	42	3	69	100	T.	Kept in bin with oats	392
393	"	S.	same	26	42	4	69	100	M.		393
394	"	S.	same	26	42	3	95	100	B.		394
395	Leaming	Y.	R. Plummer, Barnesville, O.	24	42	3	90	100	T.	Selected and dried in fall	395
396	"	Y.	same	25	42	3	89	100	M.		396
397	"	Y.	same	26	42	3	86	100	B.		397
398	Early Yellow	Y.	Jas. Porter, Leistville, O.	24	42	3	82	100	T.	From the crib	398
399	"	Y.	same	25	42	3	90	100	M.		399
400	"	Y.	same	25	42	3	96	100	B.		400
401	Hummer	W.	G. W. Raudabaugh, Celina, O.	32	47	3	42	100	T.	Hung up all winter	401
402	"	W.	same	28	47	3	76	100	M.		402
403	"	W.	same	29	47	3	88	100	B.		405
404	Bloody Butcher	S.	W. C. Pinkham, Loveland, O.	26	47	3	86	50	T.	Dried in dry house	404
405	"	S.	same	26	47	2	92	50	M.		405
406	"	S.	same	27	47	2	92	50	B.		406
407	Unknown	Y.	Moses Daily, Piketon, O.	25	47	2	92	......	......	......	407

TABLE II.—Continued.

Test number.	Variety.	Color.	Tested for—	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears.	Part of ear.	Remarks.	Test number.
408	Strawn's Yellow	Y.	H. F. Nichols, Marseilles, Ill.	24	46	3	96	50	T.	Kept in a warm loft.	408
409	"	Y.	same	24	46	2	100	50	M.		409
410	"	Y.	same	24	46	2	96	50	B.		410
411	White Silver	W.	same	25	46	4	92	50	T.	Kept in a warm loft.	411
412	"	W.	same	24	46	4	94	50	M.		412
413	"	W.	same	24	46	3	98	50	B.		413
414	Leaming	Y.	Julian Hurley, Felicity, Ohio	25	45	2	99	100	T.	From crib.	414
415	"	Y.	same	24	45	2	99	100	M.		415
416	"	Y.	same	24	45	2	100	100	B.		416
417	"	Y.	E. D. Wheeler, Springfield, Ohio	24	48	2	100	100	T.	Hung up by husk till cold weather, then boxed.	417
418	"	Y.	same	24	48	2	100	100	M.		418
419	"	Y.	same	24	48	2	98	100	B.		419
420	Unknown	Y.	Paul Lewis, Lytle, Ohio.	24	29	2	96	100	T.	Dried in fall and kept in dwelling.	420
421	"	Y.	same	23	29	2	97	100	M.		421
422	"	Y.	same	23	29	2	99	100	B.		422
423	Yellow Cap	Y.	Don P. Runkle, Mingo, Ohio	24	30	3	56	100	T.	Selected in fall and kept in granary.	423
424	"	Y.	same	24	30	3	62	100	M.		424
425	"	Y.	same	26	30	3	91	100	B.		425
426	Gourd Seed	Y.	N. W. Helfer, Plymouth, Ohio	26	30	2	77	100	T.	Selected in fall and kept in granary.	426
427	"	Y.	same	23	29	4	72	100	M.		427
428	"	Y.	same	24	29	3	90	100	B.		428
429	Blount's Prolific cross on Bunnell's Improved White	W.	J. S. Worley, Wauseon, Ohio	23	29	2	97.1	70	T.	Dried by stove and kept from freezing.	429
430	"	W.	same	24	29	2	100	60	M.		430
431	"	W.	same	24	29	3	98.6	70	B.		431
432	Little Yellow	Y.	John M. Yoder, West Liberty	30	46	3	66	100	T.	Kept in a narrow crib.	432
433	"	Y.	same	24	29	3	48	100	M.		433
434	"	Y.	same	24	29	3	84	100	B.		434
435	Leaming	Y.	W. S. Malone, New Vienna, Ohio		40	4	41	100	T.	Kept in a tight crib.	435
436	"	Y.	same		40	4	47	100	M.		436
437	"	Y.	same		40	4	39	100	B.		437
438	"	Y.	Isaac Peck, Jr., Troy, Ohio		40	3	81	100	T.	Kept in a rail crib.	438
439	"	Y.	same		40	3	84	100	M.		439
440	"	Y.	same		40	4	90	100	B.		440

441	Farnsworth's Improved	Y.	W. W. Farnsworth, Waterville, O.	......	40	3	90	....	T.		441
442	"	Y.	same	......	40	3	96	....	M.		442
443	"	Y.	same	.....	40	3	90	....	B.		443
444	Wysor's Shoe Peg	W.	same	......	40	4	90	....	....		444
445	Imp. Clarage	Y.	W. B. Kirk, Parrotts, O.	23	43	3	72	100	T.	Kept in a rail crib	445
446	"	Y.	same	23	48	8	66	100	M.		446
447	"	Y.	same	23	43	4	80	100	B.		447
448	Unknown	Y.	Fre. Patton, Jewett, O.	23	43	3	66	100	T.	Kept in a crib	448
449	"	Y.	same	23	43	8	53	100	M.		449
450	"	Y.	same	24	43	3	73	100	B.		450
451	"	W.	M. E. McGrath, Ewington, O.	23	63	3	88	100	T.		451
452	"	W.	same	23	43	3	93	100	M.		452
453	"	W.	same	23	43	3	96	100	B.		453
454	Eight Row Yellow	Y.	Chas Lazenby, Bellona, N. Y.	24	42	4	72	100	T.	From crib	454
455	"	Y.	same	24	42	4	86	100	M.		455
456	"	Y.	same	23	42	4	58	100	B.		456
457	Unknown	Y.	Daniel Duer, Millersburg, O.	23	42	2	83	100	T.	From loft containing 500 bushels	457
458	"	Y.	same	24	42	4	76	100	M.		458
459	"	Y.	same	23	42	4	100	100	B.		459
460	McGinnis	Y.	Wilber McDonald, Urbana, O.	23	42	2	91	100	T.	Kept in a crib	460
461	"	Y.	same	23	42	2	90	100	M.		461
462	"	Y.	same	23	42	3	82	100	B.		462
463	Gourd Seed	Y.	Horace Bester, Aurora, O.	24	39	4	54.7	75	T.	Dried in an airy chamber	463
464	"	Y.	same	24	39	2	88	75	M.		464
465	"	Y.	same	24	30	3	77.3	75	B.		465
466	Stoner	Y.	Wm. H. Cullumber, Lilly Chapel, O	24	39	3	97	100	T.	Hung up and dried till cold weather	466
467	"	Y.	same	24	39	4	98	100	M.		467
468	"	Y.	same	24	39	5	99	100	B.		468
468½	Unknown	Y.	Frederick Buchanan, Greencastle, O.	25	42	2	38	100	T.	Kept in a rail crib	468½
469	"	Y.	same	25	42	2	27	100	M.		469
470	"	Y.	same	30	42	4	57	100	B.		470
471	"	Y.	A. P. Milligan, Deavertown, O.	24	41	2	77	....	T.		471
472	"	Y.	same	24	41	4	88	....	M.		472
473	"	Y.	same	26	41	2	95	....	B.		473
474	"	Y.	same	24	41	4	92	....	T.		474
475	"	Y.	same	24	41	2	90	....	M.		475
476	"	Y.	same	24	41	2	97	....	B.		476
476½	Leaming	Y.	E. W. Pegg, Clintonville, O.	30	49	2	32	....	....		476½
477	"	Y.	Eben Archer, Jr., Cedarville, O.	23	26	2	95	100	T.	Kept in barrels, in house without fire	477
478	"	Y.	same	23	26	2	95	100	M.		478
479	"	Y.	same	23	28	2	98	100	B.		479
480	"	Y.	J. M. Hull, Newark, O.	24	26	2	98.9	....	T.	Kept in the house	480
481	"	Y.	same	23	26	2	98.9	....	M.		481
482	"	Y.	same	23	26	2	92.9	....	B.		482
483	"	Y.	J. K. Miller, Millersport, O.	26	26	2	33.3	....	M.		483
484	"	Y.	same	26	26	2	70	....	B.	From airy crib	484
485	"	Y.	same	26	26	2	52	....	....		485
486	Brant's Early	Y.	same	26	27	2	70	....	M.		486
487	"	Y.	same	27	27	2	96	....	B.		487
488	Sutphen	Y.	same	26	27	2	80	....	....	From shelves, warehouse	488
489	Imp. Clarage	Y.	Richard Thornton, Washington, O.	25	27	3	78.7	....	T.	Kept in a tight crib	489
490	"	Y.	same	23	27	2	78	....	M.		590
491	"	Y.	same	26	27	2	96	....	B.		491

TABLE II.—Continued.

Test number.	Variety.	Color.	Tested for.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears.	Part of ear.	Remarks.	Test number.
492	Speckled Blunt	S.	Geo. Rightmore, Millwood, O.	24	27	2	94	100	T.	From rail crib	492
493	"	S.	same	24	27	2	97	100	M.		393
494	"	S.	same	24	27	2	97	100	B.		494
495	Unknown	Y.	Gloady Stine, Milan, Ohio	35	27	3	76		T.		495
496	"	Y.	same	24	27	2	78		M.		496
497	"	Y.	same	24	27	3	77		B.		497
498	Early Yellow	Y.	Silas Peters, Hooker, O	25	28	2	83.3	30	T.	From large crib and large room	498
499	"	Y.	same	25	28	2	86.6	30	M.		499
500	"	Y.	same	25	28	2	90.6	30	B.		500
501	Unknown	W.	Robert Sheldon, Patriot, Ind	24	28	2	87				501
502	Calico	S.	A. H. Windsor, Bellefontaine, O	25	28	2	96	25	T.	Dried on swinging shelf in kitchen	502
503	"	S.	same	23	24	2	96	25	M.		503
504	"	S.	same	23	24	2	100	25	B.		504
505	McGinnis White Cap	W.	same	23	24	1	88	75	T.		505
506	" "	W.	same	23	24	2	93.5	75	M.		506
507	" "	W.	same	24	24	2	94	75	B.		507
508	Common Yellow	Y.	Joseph West, Troy, O	24	48	2	92	75	T.	From the crib	508
509	" "	Y.	same	24	48	2	93.3	75	M.		509
510	" "	Y.	same	24	48	2	97.3	75	B.		510
511	Hull's Improved	Y.	I. S. Hull, Milan, O.	23	39	3	93	100	T.	From crib and room without heat	511
512	" "	Y.	same	23	39	2	80	100	M.		512
513	" "	Y.	same	23	39	2	95	100	B.		513
513½	Hackberry and Gourdseed	Y.	Geo. Howard, La Grange, O	23	39	2	97		T.	From ordinary crib	513½
514	" " "	Y.	same	23	39	2	98		M.		514
515	" " "	Y.	same	23	39	3	99		B.		515
516	Fuson	W.	C. M. Todd, Urbana, O.	23	39	3	32.7	100	T.	From crib	516
517	"	W.	same	23	39	2	40.4	100	M.		517
518	"	W.	same	24	39	4	57	100	B.		518
519	Fuson and McGinnis	W.	same	23	39	3	95.5	100	T.	Dried in the house	519
520	" "	W.	same	23	39	3	97	100	M.		520
521	" "	W.	same	25	39	3	95	100	B.		521
522	Leaming	Y.	William Curtis, Syracuse, O.	26	37	4	98.9	100	T.	Spread on the floor 5 or 6 inches deep	522
523	"	Y.	same	26	37	3	75.8	100	M.		523
524	"	Y.	same	27	37	4	94	100	B.		524
525	Bloody Butcher	S.	D. F. Thrapp, Pandora, O.	24	37	3	94			Hung up by husks and dried	525
526	Hankrader	Y.	Walter S. Dilatush, Lebanon, O.	23	27	2	96	100	T.		526

529	Hess	W.	J. W. Peters, Galloway, O	24	27	2	75	50		From the crib	529
530	Bloody Butcher	S.	F. Beneke, West Alexandria, O.	25	27	3	81	100	T.	Selected from the crib	530
531	"	S.	same	24	27	2	71	100	M.		531
532	"	S.	same	23	27	3	90	100	B.		532
533	Unknown	W.	Joseph Lilly, Yelverton, O	27	46	3	16		T.	Crop of '82, from the crib	533
534	"	W.	same	29	46	2	7		M.		534
535	"	W.	same	27	46	3	11		B.		535
536	"	Y.	same	23	28	2	92				536
537	"	Y.	same	23	28	1	88				537
538	"	Y.	same	23	28	2	92				538
539	Leaming	Y.	Henry F. Pinkoos, Camp Denison, O.	23	28	2	58.6	100	T.	From the crib	539
540	"	Y.	same	24	28	3	41.2	100	M.		540
541	"	Y.	same	25	30	3	72.7	100	B.		541
542	Early Marblehead (sweet)	W.	W. J. Green, Ohio State University	28	46	3	56	25	T.	Kept in husk on shelf	542
543	" "	W.	same	28	46	3	72	25	M.		543
544	" "	W.	same	28	46	3	76	25	B.		544
545	Leaming	Y.	A. W. Livingston's Sons, Columbus, O.	25	28	3	52				545
546	Early White	W.	Marion Jones, Vickery, O	23	28	2	96	100	T.		546
547	"	W	same	24	28	2	97	100	M.		547
548	"	W.	same	23	28	2	97	100	B.		548
549	Mixed	Y.	M. M. Barrett, Hattonia, O	23	28	2	64	100	T.	From shed; the corn 18 inches deep	549
550	"	Y.	same	23	28	2	87	100	M.		550
551	"	Y.	same	24	46	3	73	100	B.		551
552	Ohio Dent cross on Jamison	Y.	R. W. Jobe, Tappan, O.	25	46	4	92.9		T.	Crop of '82; selected that fall and shelved and left	552
553	" "	Y.	same	27	45	4	96		M.		553
554	" "	Y.	same	28	45	4	100		B.		554
555	Yellow Dent	Y.	J. C. Parsons, Ringgold, Ohio	28	28	2	99		T.	Kept in crib	555
556	"	Y.	same	27	28	2	99		M.		556
557	"	Y.	same	23	28	2	100		B.		557
558	Common Yellow	Y.	Peter New, Higginsport, O	27	46	3	44		T.	Kept in crib	558
559	" "	Y.	same	27	46	3	27		M.		559
560	" "	Y.	same	27	46	4	66		B.		560
561	Unknown	Y.	C. H. McManus, Riota, O	25	28	2	91.8		T.	Dried in dwelling, sacked and put in barn	561
562	"	Y.	same	24	28	2	99		M.		562
563	"	Y.	same	25	28	2	95		B.		563
564	"	Y.	J. H. Little, Yellow Springs, O.	27	28	3	60	20		Kept in crib	564
565	Patrick	Y	R. Mayer, Padonia, Kan.	26	45	4	73.8	65	T.	Selected in stalk and ricked under cover	565
566	"	Y.	same	26	28	2	75.4	65	M.		566
567	"	Y.	same	27	28	2	75.4	65	B.		567
568	"	Y.	same	26	28	2	87.5	80	T.	From the crib	568
569	"	Y.	same	26	28	2	86.3	80	M.		569
570	"	Y.	same	26	28	3	67.5	80	B.		570
571	Hackberry	Y.	Egbert Hastings, La Grange, O.	26	28	2	76	100	T.	Dried on barn floor, then cribbed	571
572	"	Y.	same	26	29	2	67	100	M.		572
573	"	Y.	same	26	47	3	85	100	B.		573
574	Common Yellow	Y.	A. T. Haft, Houstonville, Pa.	25	46	3	87	100	T.	Kept in lath crib	574
575	" "	Y.	same	24	46	3	87	100	M.		575
576	" "	Y.	same	25	46	3	95	100	B.		576
577	" "	Y.	Silas Jones, Racine, Ohio.	25	46	2	42.9	14	T.		577
578	" "	Y.	same	26	46	2	35.4	99	M.		578
579	" "	Y.	same	26	46	3	44	100	B.		579
580	Clarage	Y.	A. M. Gibson, Camp Chase	28	29	2	74		M.	Selected in fall and kept over crib	580
581	"	Y.	same	28	46	3	96		B.		581

TABLE II.—Continued.

Test number.	Variety.	Color.	Tested for—	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears.	Part of ear.	Remarks.	Test number.
582	Leaming	Y.	J. H. Adams, Piqua, Ohio	28	45	3	85	100	T.	Kept in mow in barn	582
583	"	Y.	same	28	45	3	79	100	M.		583
584	"	Y.	same	28	45	2	86	100	B.		584
585	White Cap	W.	D. S. Rouke, Bellevernon, Ohio	28	28	4	93	100	T.	Kept in dwelling above the kitchen	585
586	"	W.	same	26	28	2	99	100	M.		586
587	"	W.	same	28	45	8	99	100	B.		587
588	Yellow Dent (mixed)	Y.	same	26	48	3	61	......	T	In shock all winter	588
589	"	Y.	same	26	48	5	68	......	M.		589
590	"	Y.	same	25	48	3	77.7	......	B.		590
591	Speck No. 1	Y.	John Risinger, Eaton, Ohio	25	34	2	99	......	......	Hung up, dried, 1 bu. shelled	591
592	Speck No. 2	Y.	same	25	28	2	98	......	......	Selected in fall, 1 bu. shelled	592
593	Speck No. 3	Y.	same	25	34	2	100	......	T.	Hung up and dried	593
594	"	Y.	same	24	28	2	100	......	M.		594
595	"	Y.	same	25	28	2	100	......	B.		595
596	Williams	Y.	same	25	28	3	92	......	......	Selected in fall, bu. shelled	596
597	Edison	Y.	same	25	42	2	72.7	......	......	From ½ bu. shelled	597
598	Leaming	Y.	same	25	28	3	54.1	......	......	From 1 bu. shelled	598
599	Shively	Y.	G. P. Lozier, Freesburg, Ohio	24	42	8	96	100	T.	Kept in cellar on lath between the joists	599
600	"	Y.	same	24	42	2	99	100	M.		600
601	"	Y.	same	24	42	2	98	99	B.		601
602	Yellow Dent	Y.	Chas. W. Pierce, Camden, Ohio	24	41	5	73	100	T.	From rail crib	602
603	"	Y.	same	24	42	2	89	100	M.		603
604	"	Y.	same	24	42	3	98	100	B.		604
605	Common Yellow	Y.	B. Beal, Bucyrus, Ohio	24	42	8	94	100	T.	Selected from stalks kept in dwelling	605
606	"	Y.	same	22	41	2	100	99	M.		606
607	"	Y.	same	26	41	5	96	100	B.		607
608	"	Y.	same	26	41	3	75	100	T.	From crib	608
609	"	Y.	same	26	41	2	85	100	M.		609
610	"	Y.	same	26	42	3	92	100	B.		610
611	Imp. Clarage	Y.	R. H. Morrow, Washington, Ohio	24	39	3	81	100	T.	In crib two weeks; spread on floor in December	611
612	"	Y.	same	24	39	2	74	100	M.		612
613	"	Y.	same	......	39	8	92	100	B.		613
614	Leaming	Y.	Dr. P. B. Gatch, Milford, Ohio	......	25	2	97	......	T.	From slat crib	614
615	"	Y.	same	......	25	2	99	......	M.		615
616	"	Y.	same	......	48	2	97	......	B.		616

617	Common Yellow	Y.	R. L. Henderson, Spruce Creek	24	28	2	98.9		T.	From exposed crib	617
618	"	Y.	same	24	28	4	93		M.		618
619	"	Y.	same	24	29	4	96.7		B.		619
662	Leaming	Y.	F. D. Prouty, Columbus, Ohio	29		3	100	1			662
663	Common Dent	Y.	same	27		2	100	1			663
664	Leaming	Y.	Exp. Station	21		2	72				664
665	"	Y.	same	23		2	56				665
666	"	Y.	same	23		2	92				666
667	"	Y.	same	23		2	80				667
668	"	Y.	same	28		3	96				668
669	"	Y.	same	24		2	94				669
670	Unknown	S.	L. C. Syford, Leesburg, Ohio	26	27	5	84	25	T.	Kept in rail crib	670
671	"	S.	same			5	60	25	M		671
672	"	S.	same		27	6	72	25	B.		672
673	Hackberry	Y.	I. A. Freeman, La Grange, Lorain Co., O.	20	28	5	92	100	T.	Kept from frost in house.	673
674	"	Y.	same	20		5	95	100	M.		674
675	"	Y.	same			5	97	100	B.		675
676	Ex. Yellow Dent	Y.	Caleb Hudson, Parkman, Geauga Co., O.			5	84	100	T.	Dried by stove and put in granary loft	676
677	" "	Y.	same			5	72	100	M.		677
678	" "	Y.	same			5	87	100	B.		678
679	Leaming	Y.	Steiber & Fay, Norwalk, Huron Co., Ohio	20	30	5	91	100	T.	From large crib	679
680	"	Y.	same	20	30	5	88	100	M.		680
681	"	Y.	same	20	30	5	90	100	B.		681
682	Chester County Mammoth	Y.	James Ball, New Garden, Columb'a Co., O.		71	5	54	100	T.	Dried on floor, then heap'd in one corner	682
683	" "	Y.	same			5	60	100	M		683
684	" "	Y.	same		71	4	71.5	95	B.		684
685	Leaming	Y.	Orlando Trotter, Layman, Wash'n Co., O.	24	28	2	97	100	T.	Selected in fall and kept on a board in crib	685
686	"	Y.	same	24	28	3	100	100	M.		686
687	"	Y.	same	22		2	98	100	B.		687
688	Yellow Ohio	Y.	J. A. Conroy, Troy, Miami Co., O.	25	48	4	49	100	T.	Kept in rail crib.	688
689	"	Y.	same	26	48	3	43	100	M.		689
690	"	Y.	same	28	48	4	55	100	B.		690
691	Leaming	Y.	J. P. McGrew, Columbus, Franklin Co., O.	21	48	4	94		T.	Kept in granary.	691
692	"	Y.	same	21	30	3	40		M.		692
693	"	Y.	same	21	30	3	100		B.		693
694	Common Yellow	Y.	Irvin D. Jewett, Lima Co., Iowa	25	32	3	77		T.	Hung over stove all wint'r	694
695	"	Y.	same	27	32	3	80		M.		695
696	"	Y.	same	27	36	3	75		B.		696
697	"	Y.	Mike Schmitz, Le Roy, Hennepin Co., Minn	26	32	2	70		T.	Kept in dwelling	697
698	"	Y.	same	23	29	3	88		M.		698
699	"	Y.	same	24	29	3	85		B.		699
700	Yellow Nebraska	Y.	Jas. G. Allison, Cedar Creek, Cass Co., Neb.	24	29	2	63		T.	From the crib	700
701	"	Y.	same	23	30	3	77		M.		701
702	"	Y.	same	25	30	3	74		B.		702
703	Hackberry	Y.	N. R. Johnson, Battle Creek, Mich	25		3	82			Shelled and kept near stove.	703
704	Miller	Y.	J. C. McGrew, Columbus Franklin Co., O.	24	32	2	28		T.	Crop of '82, kept since in rail crib	704
705	"	Y.	same	25	32	2	18		M.		705
706	"	Y.	same	25	32	2	54		B.		706
707	Cuppy	Y.	same	23	32	3	86		T.	From tight house	707
708	"	Y.	same	24	32	5	84		M.		708
709	"	Y.	same	28	32	2	100		B		709
710	Imp. Clarage	Y.	same		32	2	98		T.	Kept over stove-pipe in kitchen	710
711	"	Y.	same	24	32	2	100		M.		711
712	"	Y.	same	24	32	2	100		B.		712

TABLE II.—Countinued.

Test number.	Variety.	Color.	Tested for.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	No. of ears.	Part of ear.	Remarks.	Test number.
713	Common Yellow	Y.	Israel H. Cunningham, Delaware, O.	21	30	2	98			Kept from freezing	713
714	Common White	W.	same	21	30	2	98			" "	714
715	Common Yellow	Y.	Wm. M. Kerr, Salineville, O.	21	30	3	98			Kept in out-building	715
716	"	Y.	same	21	30	3	89			" "	716
717	Chester County Mammoth	Y.	Adam Hochstetler, Shanesville, O.	27	36	3	21.1		T.	Kept on shelf in crib	717
718	" "	Y.	same	23	36	3	15		M.		718
719	" "	Y.	same	25	36	5	60		B.		719
720	Curtis	Y.	Wellington Slack, Ashley, O.	22	36	3	94		T.	Dried on floor, then boxed	720
721	"	Y.	same	20	28	2	100		M.		721
722	"	Y.	same	21	29	5	97		B.		722
723	"	Y.	Solomon Ghaster, Mt. Cory, O.	20	29	3	96	100	T.	From crib	723
724	"	Y.	same	20	29	3	94	100	M.		724
725	"	Y.	same	22	34	3	97	100	B.		725
726	Leaming	Y.	Wm. Speer, Galigher, O.	20	30	3	86	100	T.	From crib	726
727	"	Y.	same	20	28	2	95	100	M.		727
728	"	Y.	same	22	29	3	99	100	B.		728
729	"	W.	John Westgarth, Campton, Ill.	20	32	3	88.4	95	T.	On floor in dwelling	729
730	"	W.	same	20	34	3	78	100	M.		730
731	"	W.	same	20	34	3	82	100	B.		731
732	Pop	W.	P. W. Barton, North Ridgeville, O.	20	30	2	98				732
733	Hackberry	Y.	same	22	30	4	64				733
734	"	Y.	J. G. Bushby, Lancaster, O.	25	40	4	79	100	T.		734
735	"	Y.	same	26	40	4	70	100	M.		735
736	"	Y.	same	21	36	3	75	100	B.		736
737	"	Y.	M. T. Dickey, Central College, O.	21		3	72	100	T.		737
738	"	Y.	same	20	25	3	63	100	M.		738
739	"	Y.	same	20	25	8	78	100	B.		739
740	Leaming	Y.	Ohio Agricultural Experiment Station	22	25	8	88	1	M.		740
741	Mixed	Y.	Lewis & Cline, Marston, Ill.	20	25	8	56	100	T.	Hung in open shed	741
742	"	Y.	same	20	25	8	97	100	M.		742
743	"	Y.	same	20	25	5	60	100	B.		743
744	"	Y.	same	20	25	5	75	100	T.	Hung in barn	744
745	"	Y.	same	20	25	8	49	100	M.		745
746	"	Y.	same	20	25	8	94	100	B.		746

747	Unknown	Y.	G. W. Manahan, Norwalk, O.	22	......	5	28	100	T.	From slat crib	747
748	"	Y.	same	20	25	3	25	100	M.		748
749	"	Y.	same	22	......	3	87	100	B.		749
750	"	Y.	Geo. W. Atherton, Peru, O.	21	......	3	74	100	T.	Hung up in crib	750
751	"	Y.	same	20	24	3	93	100	M.		751
752	"	Y.	same	20	24	3	96	100	B.		752
753	Common Yellow	Y.	B. W. Gordon, Georgetown, O.	20	24	3	91	8	......	......	753
754	"	Y.	same	20	24	3	99	......	......	......	754
755	Unknown	W.	F. A. Bonner, Trenton	20	26	2	77	......	......	......	755
756	Pride of the North	Y.	E. C. Green, Granger, O.	23	30	3	94	50	T.	From crib	756
757	"	Y.	same	23	51	2	100	50	M.		757
758	"	Y.	same	24	50	2	98	50	B.		758
759	"	Y.	Ohio Agricultural Experiment Station	21	......	2	100	3	......	......	759
760	Triplet	Y.	F. H. Webb, California Junction, Iowa	20	26	2	81.8	99	T.	Hung up and dried in fall, then cribbed in Dec.	760
761	"	Y.	same	20	26	2	97	100	M.		761
762	"	Y.	same	20	26	2	87	100	B.		762
763	Unknown	Y.	Wm. L. Swetland, Sparta, O.	22	26	3	53	100	T.	......	763
764	"	Y.	same	21	25	2	54	100	M.	......	764
765	"	Y.	same	21	26	2	66	100	B.	......	765
766	"	W.	A. H. McBrier, Montgomery, Ind.	20	21	2	82	100	T.	From well ventilated crib	766
767	"	W.	same	20	26	2	76	100	M.		767
768	"	W.	same	20	26	2	80	100	B.		768
769	Standard	Y.	J. R. McNary, Burgettstown, Pa.	20	26	2	82.8	......	......	......	769
770	Leaming	Y.	same	20	24	2	57	......	......	......	770
771	"	Y.	F. W. Orr, Sandwich, Ill.	20	26	3	49	......	......	......	771
772	Common Yellow	Y.	Geo. W. Barrett, Huttonia, O.	20	......	1	55	100	T.	From loft	772
773	"	Y.	same	20	26	3	54	100	M.		773
774	"	Y.	same	21	26	3	83	100	B.		774
775	"	Y.	G. M. Wilber, Marysville, O.	21	29	3	41	......	T.	......	775
776	"	Y.	same	20	28	3	80	......	M	......	776
777	"	Y.	same	21	29	3	68	......	B.	......	777
778	"	Y.	H. S. Miller, Mendon, Mich.	20	24	2	98	......	......	Kept on rack over cook stove	778
779	Pride of the North	Y.	same	22	27	2	56	......	......	......	779
780	Michigan White Dent	W.	McKercher Bros., Moinville, O.	......	27	4	65	99	T.	Hung up in the fall	780
781	"	W.	same	22	27	4	91	100	M.		781
782	"	W.	same	21	......	2	66.7	75	B.		782
783	Leaming	Y.	J. F. Linton, Columbus, O.	23	......	4	28	50	T.	Kept in the loft	783
784	"	Y.	same	22	28	2	12	50	M.		784
785	"	Y.	same	23	30	2	80	50	B.		785
786	Adams Early	W.	same	24	32	3	56	50	T.	Kept in the loft	786
787	"	W.	same	25	32	3	30	50	M.		787
788	"	W.	same	31	......	3	62	50	B.		788
789	"	Y.	Lewis Legg, Clintonville, O.	......	28	5	89	......	......	Kept in a bin	789
790	Red Nose	Y.	Burgess Shank, Aurelius, N. Y.	20	31	2	77	100	T.	Kept in an open crib	790
791	"	Y.	same	21	30	3	85	100	M.		791
792	"	Y.	same	21	30	3	76	100	B.		792
793	Mixed	Y.	Clifford Merriam, Bryan, O.	20	32	3	74	100	T.	Kept in a dwelling	793
794	"	Y.	same	20	28	3	95	100	M.		794
795	"	Y.	same	19	26	3	84	100	B.		795
796	Unknown	Y.	H. B. Cox, Netawaka, Kan.	22	25	2	84	100	T.	......	796
797	"	Y.	same	22	......	2	80	100	M.	......	797
798	"	Y.	same	22	28	2	84	100	B.	......	798

TABLE II.—Continued.

Test number.	Variety.	Color.	Tested for.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears.	Part of ears.	Remarks.	Test number.
799	Small McGinnis	Y.	Jas. Patton, Quincy, Kan	26	28	2	93	100	T.	Ricked in warm dwell'ng	799
800	"	Y.	same	21	21	2	100	100	M.		800
801	"	Y.	same	19	26	2	99	100	B.		801
802	Unknown	Y.	W. B. Kenrick, Lytel, O.	22	26	2	43	100	T.	From open crib	802
803	"	Y.	same	20	......	2	25	100	M.		803
804	"	Y.	same	..	......	4	52,9	85	B.		804
805	Gun	Y.	Wm. Thrapp, Napoleon, O	22	......	3	40	......	T.	From ordinary crib	805
806	"	Y.	same	21	28	3	25	......	M.		806
807	"	Y.	same	23	......	3	80	......	B.		807
808	Unknown	W.	E. W. Pegg, Clintonville, O	......	28	5	78	......	......	From crib	808
809	"	W.	same	24	....	4	3	......	......		809
810	"	Y.	E. E. Pegg, Clintonville, O	20	24	3	94	......	......		810
811	"	Y.	same	21	26	4	94	......	......		811
812	"	W	J. W. Martin, Hunter, O	19	32	3	100	......	......	Hung up near the fire	812
813	"	Y.	R. Sloan, Avenue, O	22	29	3	12	......	T.		813
814	"	Y.	same	......	29	3	14	......	M.		814
815	"	Y.	same	....	......	4	43	......	B.		815
816	"	Y.	R. Baker, Elyria, O	20	20	3	86	50	......	From the crib	816
817	"	Y.	John T. Evans, Delaware, O	23	24	1	17.8	......	......		817
818	Vickers	Y.	Ohio Agrl Experiment Station	22	27	4	76	25	T.		818
819	"	Y.	same	22	......	3	100	25	M.		819
820	"	Y.	same	22	......	3	88	25	B.		820
821	Leaming	Y.	W. Brotherton, O. S. U. Farm Supt	....	.....	3	88	25	T.	Kept in a crib	821
822	"	Y.	same	24	......	3	48	25	M.		822
823	"	Y.	same	24	......	3	81	25	B.		823
824	Bottom	Y.	Wm. W. Crane, Tippecanoe City, O	22	......	3	82	100	T.	From the crib	824
825	"	Y.	same	21	30	3	86	100	M.		825
826	"	Y.	same	22	......	3	78	100	B.		826
827	Leaming	Y.	same	22	45	4	57	100	T.	Hung on wire in the barn	827
828	"	Y.	same	23	45	3	50	100	M.		828
829	"	Y.	same	28	40	3	86	100	B.		829
830	Common Yellow	Y.	Sam'l Sullivan, Tippecanoe City, O	21	45	4	55	100	T.	Covered with straw in closed crib	830
831	"	Y.	same	20	27	3	55	100	M.		831
832	"	Y.	same	25	......	4	77	100	B.		832
833	Common White	W.	same	22	38	3	79	......	......	From open crib	833

834	Leaming	Y.	L. B. Wing, Bement, Ill	......	......	2	35	......	......	From crib	834
835	Golden Beauty	Y.	S. J. Galloway, Montgomery, O	24	40	3	56	......	......	From W. Atlee Burpee	835
836	Leaming	Y.	L. B. Wing, Bement, Ill	......	40	3	2	......	......	From crib	836
837	Ex. Golden Rysley	Y.	W. D. Williams, Galena, O	24	30	3	69	100	T.	......	837
838	" "	Y.	same	24	33	5	70	100	M.	......	838
839	Leaming	Y.	W. Brotherton, O. S. U. Farm Supt	24	33	4	82	25	T.	From crib	839
840	"	Y.	same	24	33	4	8	25	M.		840
841	"	Y.	same	......	33	4	40	25	B.		841
842	Unknown	Y.	J. S. Funk, West Liberty, O	23	27	2	100	......	......	......	842
843	"	Y.	Jesse Hagler, Washington C. H., O	19	22	3	88	100	......	From large crib	843
844	Leaming	Y.	Geo. W. Gill, Columbus, O	22	26	3	81	100	......	......	844
845	Unknown	Y.	S. A. Vesey, Brice, O	27	31	3	40	......	......	Kept in barrels	845
846	"	Y.	same	30	......	3	43	......	......	Kept in boxes	846
847	"	Y.	Chas. Vesey, Brice, O	26	31	3	58	......	......	From top of bin	847
848	Triumph Sweet	W.	W. J. Green, Supt. O. S. U. Gardens	24	28	3	73	......	......	......	848

TABLE III.—SEED TESTS, 1883 AND 1884.

Test number.	Variety of seed.	Tested for.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Remarks.	Test number.
	Grass.	1883.						
18	Timothy	Frank Hayden, Columbus, O	42			66	Western grown. Test disturbed and spoiled after 4 days.	18
19	"	A. W. Livingston's Sons, Columbus, O	38			48	"	19
20	"	Meyer & Guthke, Columbus, O	40			88	"	20
21	"	Wm. Taylor, Columbus, O	40			90	"	21
22	"	Frank Hayden, Columbus, O	42			74	Grown in Franklin county.	22
	Clover.							
23	Common Red	A. W. Livingston's Sons, Columbus, O	22	68	14	66	Grown in Franklin county	23
24	"	Frank Hayden, Columbus, O	22	40	21	66	" "	24
25	"	Wm. Taylor, Columbus, O	22	68	18	70	" "	25
	Oats.							
54	Common	C. Searle, Berkshire, O	40	80	14	97	Grown in Franklin county	54
74	White Russian	A. W. Livingston's Sons, Columbus, O	48	56	9	94		74
112	Side	J. F. Thompson, Layman, O		120	11	94		112
	Osage Orange.							
75		A. W. Livingston's Sons, Columbus, O	312			8		75
	Onion.							
85	Yellow Danvers	W. J. Green, O. S. U. Garden Superintendent	86			88		85
88	"	" "	36			44		88
	Bean.							
108	Early Valentine	J. S. Roloson, Columbus, O	20	34	6	100		108

	Tomato.							
62	Acme	Experiment Station	60	72	10	78		62
	Cane.							
113	Early Amber	J. Newton Berry, Hunter, O.	72		11	99		113
	Wheat.							
127	Velvet Chaff	Experiment Station			9	98	High graded. Grown at O. S. University	127
128	"	"			12	96	Ungraded.	128
129	White Velvet	"			4	93	Crop of 1882. Grown by W. L. Ferris, Pleasant Plains, O.	129
130	"	"			6	98	Crop of 1883.	130
	Cane.	1884.						
205	Early Amber	W. F. Brown, Oxford, O.		110	9	78		205
206	"	" "		96	7	81		206

In Table III is given the details of tests of seeds other than corn, made in 1883 and 1884.

Table IV gives the tests of seeds used in the experimental field work. In this table is given the details of tests finished at the time of going to press. The vitality of all seeds used in the experimental field work is to be tested and a complete record kept.

In the column under "Sample from" is given the name of the seedsman from which the seed was procured. Nos. 887, 888 and 889 were purchased at a grocery in Columbus, Ohio; all others were procured directly from the seedsmen, whose names are given. In the column marked "Year seed was grown" is given the year the seeds were grown, granting that they were fresh at the time they were purchased. Those marked 1883 were purchased for planting this spring (1884), and those marked 1882 were purchased a year ago.

TABLE IV.—Seed Tests, 1884.

Test number.	Variety of seed.	Sample from—	Year seed was grown.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—Per cent.
	Cabbage.						
327	Early Summer	Peter Henderson & Co., New York	1882	26	69	6	74
328	Early Jersey Wakefield	same	1882	20	69	6	87
620	“ “	A. W. Livington's Sons, Columbus, O	1883	....	44	4	88
621	Fottler's Early Drumhead	Isaac F. Tillinghast, La Plume, Pa	1883	....	44	6	92
623	Early Summer	A. W. Livingston's Sons, Columbus, O	1883	....	44	5	100
624	“	Peter Henderson & Co., New York	1883	....	44	4	92
656	Early Jersey Wakefield	same	1882	....	40	3	68
657	“ “	D. M. Ferry & Co., Detroit, Mich	1883	21	52	4	90
658	“ “	A. W. Livingston's Sons, Columbus, O	1883	22	72	5	80
659	“ “	Isaac F. Tillinghast, La Plume, Pa	1883	22	45	5	86
660	“ “	same	1883	20	73	7	90
661	“ “	D. Landreth & Sons, Philadelphia	1883	21	30	4	76
849	“ “	Peter Henderson & Co., New York	1882	20	31	4	82
850	Henderson's Early Summer	same	1883	20	31	4	90
851	“ “	A. W. Livingston's Sons, Columbus, O	1883	19	47	5	90
852	“ “	D. M. Ferry & Co., Detroit, Mich	1883	18	24	3	88
853	Early Winningstadt	Vilmorin, Andreaux & Co., Paris, France	1883	19	40	3	84
854	“	Peter Henderson & Co., New York	1883	18	36	5	90
855	Fottler's Early Drumhead	Isaac F. Tillinghast, La Plume, Ind	1883	24	50	5	98
856	Dutch Early Drumhead	Vilmorin, Andreaux & Co., Paris, France	1883	43	70	7	88
857	St. John's Day Drumhead	same	1883	24	....	3	90
858	Paris Market	same	1883	20	70	7	90
859	Very Early Etampes	same	1883	22	65	6	86

TABLE IV.—Continued.

Test number.	Variety of seed.	Sample from—	Year seed was grown.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.
	CABBAGE—Continued.						
860	Early Deep Head	James J. H. Gregory, Marblehead, Mass	1883	22	65	4	88
861	Henderson's Premier	Peter Henderson & Co., New York	1883	22	....	4	96
862	Early Summer Flat Head	D. Landreth & Sons, Philadelphia, Pa	1883	21	....	4	94
863	Bloonsdale Early Market	same	1883	22	70	6	72
864	Landreth's Earliest	same	1883	23	48	4	86
865	Early Dwarf Ulm Savoy	D. M. Ferry & Co., Detroit, Mich	1883	21	48	3	100
866	Early Paris Savoy	Vilmorin, Andreaux & Co., Paris, France	1883	20	47	4	94
868	Early Bleichfield Giant	D. M. Ferry & Co., Detroit, Mich	1882	24	73	6	58
869	" "	B. K. Bliss & Sons, New York	1882	24	84	7	36
870	Early Wakefield	James Vick, Rochester, N. Y	1882	56	88	4	14
871	"	Hiram Sibley & Co., Rochester, N. Y	1882	19	65	7	56
872	St. John's Day Early	same	1882	24	69	6	70
873	Early Winningstadt	D. M. Ferry & Co., Detroit, Mich	1882	18	....	6	90
874	Early Wyman	James J. H. Gregory, Marblehead, Mass	1882	19	60	6	58
875	Early Summer	Peter Henderson & Co., New York	1882	18	40	3	88
876	Early Etampes	Hiram Sibley & Co., Rochester, N. Y	1882	18	48	3	44
884	Surehead	J. A. Everitt & Co., Watsontown, Pa	1882	17	....	3	88
885	Excelsior Flat Dutch	James Vick, Rochester, N. Y	1883	17	....	5	72
886	Premium Flat Dutch	same	1883	19	....	5	86
887	" "	D. M. Ferry & Co., Detroit, Mich	1883	20	....	3	72
888	Premium Drumhead	same	1883	20	65	6	38
889	Early Large York	same	1883	23	....	3	28

891	" "	James J. H. Gregory, Marblehead, Mass	1883	22		3	80
892	" "	Isaac F. Tillinghast, La Plume, Pa	1883	18	24	3	96
893	" "	same	1883	19	28	6	80
894	" "	Joseph Harris, Rochester, N. Y.	1883	19		6	74
895	Excelsior Flat Dutch	same	1883	18	23	2	76
896	" "	Isaac F. Tillinghast, La Plume, Ind	1883	17		3	96
897	" "	same	1883	17		2	90
898	Bloomsdale Flat Dutch	D. Landreth & Sons, Philadelphia, Pa	1883	18		3	82
899	Brunswick Drumhead	Vilmorin, Andreaux & Co., Paris, France	1983	18		4	86
900	Fottler's Improved Brunswick	Isaac F. Tillinghast, La Plume, Pa	1883	16		2	92
901	Garfield Pickler	same	1883	22		3	92
902	Late Mountain	D. Landreth & Sons, Philadelphia, Pa	1883	18		3	80
903	Marblehead Mammoth	James J. H. Gregory, Marblehead, Mass	1883	17	24	2	86
904	Harris' Short Stem	Joseph Harris, Rochester, N. Y	1883	18		2	86
905	Drumhead Savoy	D. Landreth & Sons, Philadelphia, Pa	1883	17	24	4	94
906	Green Curled Savoy	same	1883	18		3	74
907	Netted Savoy	Peter Henderson & Co., New York	1883	18	24	3	81
908	Improved American Savoy	D. M. Ferry & Co., Detroit, Mich	1883	18	24	2	78
909	Premium Drumhead	same	1883	18		4	88
910	Marblehead Mammoth	same	1883	18		3	81
911	" "	Peter Henderson & Co., New York	1883	18		3	92
912	Drumhead Quintal	Vilmorin, Andreaux & Co., Paris, France	1883			6	92
913	Drumhead Flat Dutch	same	1883	18		3	96
914	Drumhead Dark Red	same	1883	18	24	2	94
915	Drumhead St. John's Day	same	1883	20	46	7	82
916	Drumhead St. Denis' Day	same	1883		46	7	84
917	Ox-heart	same	1883	20		4	94
918	Vangersord Winter	same	1883		48	7	88
919	Pointed Pomeranian	same	1883	20	46	7	68
920	Vertus Savoy	same	1883	16		2	98
921	Green Globe Savoy	same	1883			4	84
925	Late Flat Dutch	Peter Henderson & Co., New York	1883	20		4	86
926	Fottler's Improved Drumhead	A. W. Livington's Sons, Columbus, Ohio	1883	17	40	5	76
927	Bridgeport Late Drumhead	same	1883	17	41	5	88
928	Large Drumhead	same	1883	17	40	3	62
929	Drumhead Savoy	same	1883	24	42	7	64
930	Premium Flat Dutch	same	1883	16	26	3	86
931	Marblehead Mammoth	same	1883	16	26	3	98
932	Chase's Excelsior	same	1883		33	3	94
933	Stone Mason	same	1883	17	36	3	22

TABLE IV.—Continued.

Test number.	Variety of seed.	Samples from—	Year seed was grown.	First seed sprouted hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.
	ONIONS.						
622	Danvers Yellow	I. E. Jones, Clintonville, O	1883		90	18	68
625	"	J. L. Green, Medina, O	1882			14	50
626	Red Globe	A. W. Livingston's Sons	1883			14	96
627	New White	same	1883		96	9	78
628	Large Red Wethersfield	same	1883		110	14	80
629	Yellow Globe Danvers	same	1883		100	9	82
630	Danvers Yellow	Isaac F. Tillinghast	1883			14	92
631	"	D. Landreth & Sons	1883			14	76
632	"	same	1883			14	90
633	"	same	1883			14	58
634	"	Peter Henderson & Co	1883			14	34
635	"	Jos. Harris, Rochester, N. Y	1883		90	14	62
636	"	D. M. Ferry & Co	1883		90	15	98
637	"	same	1883			14	50
638	"	Vilmorin, Andreaux & Co	1883			14	82
639	Red Wethersfield	Peter Henderson & Co	1883		217	15	58
651	Danvers Yellow	E. C. Green, Granger, O	1883	36	63	15	84
652	"	D. Landreth & Sons	1883	36	87	10	92
653	"	same	1883	61	130	15	84
654	"	same	1883	41	87	8	80
655	Red Wethersfield	same	1883	41	130	10	100

	PEAS.						
640	American Wonder	B. K. Bliss & Sons	1883	....	90	7	100
641	Landreth's Extra Early	D. Landreth & Sons	1883	....	43	4	96
612	Ferry's Extra Early	D. M. Ferry & Co	1883	....	43	4	98
643	First and Best	same	1883	....	43	4	92
644	Tom Thumb	same	1883	....	43	15	92
645	First in Market	A. W. Livingston's Sons	1883	....	43	4	98
646	Stratagem	B. K. Bliss & Sons	1883	....	....	4	92
647	Laxton's Marvel	Peter Henderson & Co	1883	....	96	8	100
648	Telephone	B. K. Bliss & Sons	1883	....	64	8	96
649	American Racer	same	1883	....	64	8	100
650	Pride of the Market	same	1883	....	....	8	88
	TOMATOES.						
235	Acme	W. J. Green, Supt. O. S U. gardens	1882	....	50	5	95
236	"	same	1883	....	40	10	84
	RADISHES.						
951	Ey. Smooth Turnip	W. J. Green	1883	13	39	2	58
952	Rat Tail	Peter Henderson & Co	1883	13	21	6	92
953	Yellow Summer Turnip	same	1883	13	38	4	76
954	Rose China Winter	same	1883	13	34	4	92
955	Ey. Round Red	same	1883	18	40	2	36
956	Wood's Ey. Frame	same	1883	13	40	4	50
957	"	Vilmorin, Andreaux & Co	1883	17	40	4	62
958	Scarlet Olive-shaped	same	1883	13	20	5	92
959	White "	same	1883	15	27	6	36
960	Black Spanish	same	1883	19	....	5	72
961	White Naples	same	1883	13	20	3	94
962	Scarlet China	same	1883	15	20	3	90
963	White Giant Stuttgart	same	1883	15	....	5	98
964	White Strasburg	same	1883	19	28	7	46
965	Scarlet Salmon	same	1883	18	21	5	52
966	Half-long Scarlet	same	1883	14	19	3	72
967	Yellow Summer Turnip	same	1883	18	24	5	74
968	Ey. Scarlet "	same	1883	16	19	3	40
969	White-tip "	same	1883	16	21	7	56
970	Gray Summer "	same	1883	17	23	3	86
971	White Small "	same	1883	18	....	7	56
972	Yellow perfection	same	1883	14	22	5	96

Table V. exhibits the results of the germination of wheat. In testing the vitality of wheat some of the kernels were used of those counted and weighed, as shown in table A, pages 19 and 20 of this report.

In column under "Size of ears," the letter "L" stands for large or selected ears, from which the kernels were taken. These were the finest that could be found in the plot. "M" means medium or average ears, as near as could be selected; "S" stands for the smallest ears that could be found. In the column on the right is given the average per cent. germinated of the kernels from the large, medium, and small ears of each variety. The summary of the tests in this table is given on page 49 of this report.

TABE V.—Seed Tests—Varieties of Wheat and Selection of Ears.

Test number.	Variety.	Size of ears.	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Average sprouted from all ears—per cent.
131	Fultz cross on Clawson	L.	23	3	92	90
132	" "	M.	23	4	88	
133	" "	S.	23	4	90	
134	Smith's Improved	L.	23	4	78	80.7
135	"	M.	23	4	82	
136	"	S.	23	4	82	
137	Velvet Chaff	L.	24	5	100	100
138	"	M.	24	5	100	
139	"	S.	24	5	100	
140	Golden Drop	L.	24	4	100	100
141	"	M.	24	4	100	
142	"	S.	24	5	100	
143	Roscoe	L.	22	7	86	86
144	"	M.	22	3	80	
145	"	S.	22	3	92	
146	Grecian	L.	22	3	92	86
147	"	M.	22	3	78	
148	"	S.	22	7	88	
149	Lincoln	L.	22	7	58	63.3
150	"	M.	22	7	52	
151	"	S.	22	7	80	
152	Lancaster	L.	24	6	90	94.7
153	"	M.	24	6	96	
154	"	S.	24	6	98	
155	Small Frame	L.	24	8	96	96.7
156	"	M.	24	7	98	
157	"	S.	24	7	96	
158	Cornell No. 3	L.	22	7	82	83.3
159	"	M.	22	10	84	
160	"	S.	22	7	84	
161	Yellow Blue Stem	L.	22	6	98	97.3
162	"	M.	22	5	94	
163	"	S.	22	4	100	

TABLE V.—Continued.

Test number.	Variety.	Size of ears.	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Average sprouted from all ears—per cent.
164	Australian	L.	22	5	90	94.7
165	"	M.	22	2	94	
166	"	S.	22	4	100	
167	Finley	L.	22	6	92	92.7
168	"	M.	22	6	94	
169	"	S.	22	6	92	
170	Fultz	L.	....	6	96	96
171	"	M.	....	6	92	
172	"	S.	....	5	100	
173	Washington Glass	L.	22	6	74	78
174	"	M.	22	6	90	
175	"	S.	22	5	70	
176	Red Caff	L.	....	6	86	87.3
177	"	M.	....	7	88	
178	"	S.	....	7	88	
179	White Blue Stem	L.	22	3	100	99.3
180	"	M.	22	2	100	
181	"	S.	22	3	98	
182	Egyptian	L.	22	3	96	98
183	"	M.	22	3	98	
184	"	S.	22	3	100	
185	Clawson	L.	22	3	94	89.3
186	"	M.	22	3	84	
187	"	S.	22	6	90	
188	Mediterranean	L.	24	3	86	91.3
189	"	M.	24	3	92	
190	"	S.	22	2	96	
191	Martin's Amber	L.	22	3	88	91.3
192	"	M.	22	3	90	
193	"	S.	22	4	96	
194	Silver Chaff	L.	22	4	74	86
195	"	M.	22	4	86	
196	"	S.	22	4	98	

A series of tests was begun to ascertain the effect of a temperature at the freezing point, upon seeds kept sufficiently moist for germination. This was done by placing the seeds upon a block of ice, placed where it would keep slowly melting. The seeds all absorbed water and swelled, and the clover, wheat, and peas looked as if they would germinate; but in no instance was the seed-coat burst by the radicle. Some of the seeds were removed from time to time and germinated. The cold seemed to have no effect upon the seeds, except upon the clover, which seemed to gradually lose vitality after ten days. The longest time any of the seeds were left upon the ice was twenty-six days.

The details of these tests are given in Table VI. The number of days th the seeds were on the melting ice before they were tested is given in the colum marked "Number of Days on Ice." The balance of the table is the same explained for other tests.

TABLE VI.—Seed Tests.

Test number.	Variety.	Number days on ice.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—
237	Clover, common red	2	22	45	4	72
238	"	9	21	48	2	48
242	"	10	22	48	6	73
265	"	18	20	20	1	36
304	"	26	20	43	5	31
239	Timothy	9	24	48	7	96
266	"	18	38	44	4	88
305	"	26	25	43	9	93
240	Wheat, red	9	20	24	1	100
264	"	18	18	21	2	100
303	"	26	17	25	3	100
241	Wheat, white	10	18	24	2	100
263	"	18	18	21	1	100
302	"	26	15	17	1	80
243	Pepper, red	10	72	96	7	80
267	"	18	65	86	6	90
306	"	26	72	168	8	80
268	Bean, Golden Wax	18	20	20	2	80
269	Pea, mixed varieties	18	18	20	1	100

Twelve tests were made with currant, gooseberry, blackberry and raspberr seeds, taken soon after they had ripened, to ascertain if they could be made t germinate at that time. The seeds were left for thirty days in moist earth, an when removed not a seed had germinated, and all appeared sound.

Some of the same seeds were kept in a dry, warm place until spring an again tested, but none germinated. Some of them were then placed on mel ing ice and tested as in the experiments with clover, timothy, etc., but a before, none sprouted.

A specimen of Mediterranean wheat, imported in 1882 from Italy, by th Department of Agriculture, was examined for impurities, and in it was foun seventeen varieties of foreign seeds, *i. e.*, other than Mediterranean wheat Among these were Cockle (*Lychnis Githago*), Wheat Thief (*Lithospermu arvense*), Field Crowfoot (*Ranunculus arvensis*), Chess (*Bromus*), Barley (*Hor deum*), Oat (*Avena*), one species each of *Labiatæ* and *Polygonaciæ*, two o *Leguminosæ*, and two varieties of wheat.

DIRECTIONS FOR SAMPLING AND SENDING SEEDS.

Care should be taken to have the sample a fair average of the whole amount of seed from which it was taken.

Of the smaller field seeds, such as wheat, clover, timothy, etc., about two ounces should be sent. Of garden vegetables half an ounce should be sent. Of corn, one hundred and two or three ears should be taken from all parts of the bin and one kernel taken from the middle of each ear. Of corn that had been shelled, two hundred kernels should be sent.

These samples should be sent by mail, in *stout* paper bags or boxes, or cloth bags, securely tied, but not sealed. The name of the sender should be written on the outside of each package with "from" written above it, but there should be no writing inside. Under these conditions the postage is one cent for each ounce or fraction thereof, which must be fully prepaid or the package will not be forwarded. A letter should accompany the package, giving the name of the variety of seed sent, the year in which it was grown, by whom it was grown, or from whom purchased, and other points of interest. In the case of corn, it should be stated how the corn was cured, and how kept during winter.

The report on the germination of a sample should not be expected sooner than two weeks after the sample is received. As soon as completed each test is reported to the sender on the following form:

REPORT OF SEED TEST.

COLUMBUS, OHIO, ..., 188...

Station Test No. ....

Received ...., 188...

Variety...

Sample from ....

Grown by ....

Per cent. by weight of pure seed, ...

Per cent. by weight of impurities, ...

Per cent. of seed sprouted, ...

Per cent. of seed remaining apparently sound, ...

First seed sprouted in .... **hours.**

Of germinated seed, half sprouted in .... **hours.**

Last seed sprouted in .... **days.**

Test lasted .... **days.**

...., *Botanist.*

...., *Director.*

METEROLOGICAL REPORT—STATION SUMMARY FOR THE YEAR, BEGINNING NOVEMBER 1, 1882, AND ENDING OCTOBER 31, 1883.

Number of Station.	Stations.	Counties.	Mean Barometer.	Highest Barometer.	Date	Lowest Barometer.	Date.	Range of Barometer.	Mean Relative Humidity.	Mean Temperature.	Highest Temperature.	Date.
1	Cincinnati	Hamilton	30.098	30.739	Dec. 7th	29.512	Oct. 29th	1.227	70.0	54.7	94.0	July 22d.
8	Dayton	Montgomery	30.121	30.805	Dec. 7th	29.462	Oct. 29th	1.343	76.7	50.3	94.0	July 3d.
4A	Wapakoneta	Auglaize	30.119	30.762	Dec. 8th	29.456	Oct. 29th	1.306	80.1	48.4	97.8	July 3d.
[1]*4B	Sidney	Shelby										
5	Upper Sandusky	Wyandot	30.108	30.744	Feb. 18th	29.396	Oct. 29th	1.348	78.4	48.7	91.0	July 3d.
6	Wauseon	Fulton	30.036	30.640	Dec. 8th	29.320	Oct. 29th	1.320	80.3	44.9	93.0	August 22d.
[2]*7	Lebanon	Warren							78.2	51.9	93.8	July 23d.
[2]*8	North Lewisburg	Champaign								52.5	92.0	July 3d.
[3]*9A	Levering	Knox							77.4	46.0	90.0	August 22d.
[4]*9B	Gambier	Knox										
10	Toledo	Lucas	30.048	30.662	Feb. 18th	29.375	Oct. 29th	1.287	66.7	48.5	93.0	July 4th.
[5]*11	Ironton	Lawrence	30.081	30.746	Dec. 8th	29.564	April 23d	1.182		54.7	91.0	August 22d.
[2]*11A	Washington	Fayette							74.7	50.4	95.3	July 22d.
[4]*12B	Waverly	Pike										
13A	Columbus	Franklin	30.075	30.687	Feb. 18th	29.423	Oct. 29th	1.264	67.5	50.8	94.0	July 23d.
13B	Ohio State University	Franklin							82.3	48.7	97.0	August 22d.
[2]*13C	Westerville	Franklin	30.066	30.714	Dec. 8th	29.386	Oct. 29th	1.328	82.4	48.7	91.0	July 3d.
14	Oberlin	Lorain							84.1	45.6	96.5	July 4th.
15	Marietta	Washington	30.120	30.771	Dec. 8th	29.390	May 21st	1.381	77.3	52.0	94.4	August 22d.
16	Granville	Licking							77.4	48.7	92.5	August 22d.
17	Quaker City	Guernsey							78.6	48.5	92.5	July 22d.
18	Canton	Stark	30.092	30.698	Dec. 8th	29.397	Oct. 29th	1.301	75.9	47.0	90.7	August 22d.
19	Warren	Trumbull							76.6	46.6	95.0	July 4th.
[1]*20	Wooster	Wayne							77.7	49.3	93.0	Sept. 15th.
21A	Cleveland	Cuyahoga	30.064	30.670	Feb. 2d	29.320	Oct. 29th	1.350	71.4	46.6	92.5	August 22d.
[4]*21B	Cleveland	Cuyahoga										

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*[1] No reports for November and December.

[2] No report for November.

[3] No report for September.

[4] Reports from this station incomplete, therefore not used in this summary.

[5] No report for February.

METEROLOGICAL REPORT—Continued.

Number of Station.	Stations.	Counties.	Lowest Temperature.	Date.	Range of Temperature.	Mean Daily Range of Temperature.	Greatest Daily Range of Temperature.	Date.	Least Daily Range of Temperature.	Date.	Number of Clear Days.	Number of Fair Days.	Number of Cloudy Days.	Days Rain Fell.	Total Rainfall.	Average Daily Rainfall.
1	Cincinnati	Hamilton	1.0	Dec. 8th	93.0	15.4	36.0	Dec. 7th	4.0	Oct. 19th	87	145	133	187	45.82	.126
8	Dayton	Montgomery	-11.0	Dec. 8th	105.0	17.8	43.0	Dec. 7th	3.5	Oct. 19th	107	126	132	134	42.26	.117
4A	Wapankoneta	Auglaize	-14.9	Dec. 8th	112.7	21.8	47.5	May 7th	2.0	July 15th	106	116	112	105	42.21	.120
[1]*4B	Sidney	Shelby														
5	Upper Sandusky	Wyandot	-10.0	Dec. 8th	101.0	20.6	43.0	Jan. 22d	6.0	April 6th	124	114	130	143	41.22	.114
6	Wauseon	Fulton	-17.5	Jan. 22d	110.5	21.6	55.2	March 18th	3.2	Feb. 7th	64	150	151	180	40.91	.113
[2]*7	Lebanon	Warren	-3.0	Jan. 22d	96.8	18.6	36.5	Jan. 24th	8.5	Oct. 19th	85	112	107	148	48.80	.135
[2]*8	North Lewisburg	Champaign	-5.0	Jan. 22d	97.0	17.6	34.0	May 9th	2.0	Jan. 77h.	99	111	124	118	42.75	.118
[3]*9 A	Levering	Knox	-9.0	Dec. 8th	99.0	17.9	41.0	Feb. 17th	8.5	Dec. 27th	108	122	105	124	47.27	.130
[4]*9B	Gambier	Knox														
10	Toledo	Lucas	-9.0	Jan. 22d	102.0	15.5	51.0	March 18th	4.0	Dec. 27th	71	155	139	177	33.20	.091
[5]*11	Ironton	Lawrence	-5.0	Dec. 8th	96.0	17,5	42.0	Mdrch 18th	3.0	Jan. 6th					38.21	.104
[3]*12 A	Washington	Fayette	-8.5	Dec. 8th	103.8	22.5	46.3	Dec. 7th	4.3	Oct. 19th	87	95	122	124	41.82	.125
[4]*12B	Waverly	Pike														
13 A	Columbus	Franklin	-4.0	Dec. 8th	98.0	16.9	38.0	Dec. 7th	3.0	Dec. 26th	85	144	136	181	45.22	.124
13B	Ohio State University	Franklin	-7.0	Jan. 12th	104.0	21.6	45.0	Sept. 11th	1.8	Jan. 28th	99	149	117	148	40.51	.111
[3]*13C	Westerville	Franklin	-9.5	Jan. 12th	100.5	20.0	43.0	May 7th	4.0	Dec. 27th	85	120	130	108	35.77	.099
14	Oberlin	Lorain	-12.0	Dec. 8th	108.5	21.3	51.0	April 18th	1.0	May 22d				137	40.59	.112
15	Marietta	Washington	-1.5	Dec. 8th	95.9	20.3	43.5	Jan. 24th	3.0	Feb. 22d	81	134	150	129	42.81	.119
16	Granville	Licking	-6.4	Dec. 8th	98.9	19.3	40.3	Jan. 21st	3.7	Feb. 4th	116	138	110	102	34.78	.096
17	Quaker City	Guernsey	-6.0	Dec. 8th	98.5	20.0	43.5	Feb. 17th	4.0	Dec. 27th				135	46.59	.128
18	Canton	Stark	-5.5	Dec. 8th	96.2	19.4	42.4	Feb. 17th	4.0	Dec. 23d	78	145	142	166	40.12	.111
19	Warren	Trumbull	-5.0	Dec. 8th	100.0	19.4	42.5	March 18th	2.0	Nov. 29th	53	143	185	179	35.06	.098
[1]*20	Wooster	Wayne	-2.0	Jan. 22d	95.0	17.7	41.0	May 3d	2.5	Feb. 18th	76	117	108	88	33.87	.095
21A	Cleveland	Cuyahoga	-9.0	Dec. 8th	101.5	15.7	45.0	March 18th	2.8	Dec. 23d	68	151	146	206	40.60	.112
[4]*21B	Cleveland	Cuyahoga														

*[1] No reports for November and December.
[2] No report for November.
[3] No report for September.
[4] Reports from this station incomplete, therefore not used in this summary.
[5] No report for February.

STATE SUMMARY FOR THE YEAR BEGINNING

Month.	Mean barometer.	Highest barometer.	Date.	Lowest barometer.	Date.	Range of barometer.	Mean relative humidity.	Mean temperature	Highest temperature.
November	30.188	30.570	2d, 3d	29.828	23d.	.742	78.0	40.4	75.0
December	30.159	30.805	7th.	29.688	5th.	1.167	83.1	29.2	59.0
January	30.180	30.743	22d.	29.504	20th.	1.239	81.6	24.1	61.0
February	30.283	30.752	18th.	29.720	24th.	1.032	80.5	30.5	76.0
March	30.060	30.619	5th.	29.424	10th.	1.195	75.5	32.4	75.0
April	30.009	30.382	3d.*	29.516	23d.	.866	71.5	48.1	90.0
May	29.964	30.381	6th.	29.390	21st.	.991	70.4	58.0	90.0
June	29.955	30.377	1st.	29.490	10th.	.887	75.5	69.0	92.2
July	30.025	30.315	18th.	29.642	12th.	.673	74.8	72.1	97.8
August	30.066	30.320	7th.	29.778	2d.	.542	73.3	68.2	98.0
September	30.068	30.480	10th.	29.562	24th.	.918	74.6	61.5	97.2
October	30.118	30.641	16th.	29.320	29th.	1.321	79.5	58.4	87.0
Average	30.148	30.805	*[1]	29.320	*[2]29th.	1.485	75.6	48.9	98.0

[1]* December 7th.
*[2] October 29th.
*[3] August 22d.
*[4] January 22d.
*[5] March 18.
*[6] November 1st.

Notes—

Mean barometer, 30.148.
Highest barometer, 30.805, December 7th, at Dayton.
Lowest barometer, 29.320, October 29th, at Wauseon.
Range of barometer, 1.485.
Mean relative humidity, 76.5 per cent.
Mean temperature, 48.9°.
Highest temperature, 98°, August 22d, at Waverly.
Lowest temperature, —17.5°, January 22d, at Wauseon.
Range of temperature, 115.5°.
Mean daily range of temperature, 19.2°.
Greatest daily range of temperature, 55.2°, March 18th, at Wauseon.
Least daily range of temperature, 0°, November 1st, at North Lewisburg.
Number of clear days, 90.6.
" fair days, 137.0.
" cloudy days, 136.4.
" days on which rain fell, 146.5.

NOVEMBER 1, 1882, AND ENDING OCTOBER 31, 1883.

Date.	Lowest temperature.	Date.	Range of temperature.	Mean daily range of temperature.	Greatest daily range of temperature.	Date.	Least daily range of temperature.	Date.	Number of clear days.	Number of fair days.	Number of cloudy days.	Days on which rain fell.	Rainfall for month.	Average daily rainfall.	Prevailing direction of wind.
11th.	4.5	25th.	70.5	18.2	36.0	8th.	0	1st.	5.0	10.0	15.0	12.0	2.18	.071	S.W.
21st.	—16.4	8th.	75.4	14.5	46.8	7th.	2.8	23d.	8.4	11.1	16.5	14.0	1.84	.060	W.
30th.	—17.5	22d.	78.5	16.7	45.8	21st.	1.8	28th.	8.7	10.8	17.0	16.6	2.40	.080	S.W.
16th.	—12.0	10th.	88.0	17.6	49.0	17th.	2.5	18th.	4.8	9.2	14.0	12.7	6.49	.232	W.
18th.	—17.4	20th.	92.4	19.2	55.2	18th.	4.0	26th.	7.4	12.8	11.3	11.9	2.18	.073	W.
14th.	15.0	3d.	75.0	21.5	42.8	17th.	5.0	7th.	8.4	11.6	10.0	11.0	3.06	.102	S.W.
4th.	27.4	13th.	61.6	23.2	47.5	7th.	1.0	22d.	7.7	12.7	10.6	14.1	5.72	.184	S.W.
23d.	34.5	1st.	57.7	20.7	44.5	1st.	5.0	25th.	8.5	13.7	7.8	14.5	4.25	.141	S.W.
3d.	43.0	31st.	54.8	21.1	48.2	1st.	5.5	8th.	12.4	14.4	4.2	11.2	4.16	.134	S.W.
22d.	46.5	30th.	59.0	22.7	48.0	17th.	5.0	29th.	13.0	13.0	4.0	7.0	1.88	.061	N.W.
15th.	25.0	9th.	72.2	23.4	55.0	14th.	6.0	21st.	10.8	10.7	9.0	10.8	2.72	.093	N.E.
9th.	25.0	16th.	62.0	16.3	37.6	8th.	2.5	26th.	6.0	8.0	17.0	11.7	4.66	.150	N.E.
*3	—17.5	*4	115.5	19.2	55.2	*5	0.0	*6	90.6	137.0	136.4	146.5	41.49	.115	S.W.

Mean rainfall, 41.49 inches.
Mean daily rainfall, .115 inches.
Greatest rainfall, 48.80 inches.
Least rainfall, 33.20 inches.
Prevailing direction of wind, South-west.
Mean number of clear days per month, 7.5.
" " fair days per month, 11.4.
" " cloudy days per month, 11.4.
" " days on which rain fell, 12.2.
Mean monthly rainfall, 3.46 inches.

SUMMARY FOR STATION 13 B., LOCATED AT OHIO STATE UNIVERSITY, FOR YEAR BEGINNING NOVEMBER 1, 1882, AND ENDING OCTOBER 31, 1883.

Month.	Mean relative humidity.	Mean temperature.	Highest temperature.	Date.	Lowest temperature.	Date.	Range of temperature.	Mean daily range of temperature.	Greatest daily range of temperature.	Date.	Least daily range of temperature.	Date.	Number of clear days.	Number of fair days.	Number of cloudy days.	Number of days on which rain fell.	Rainfall for month.	Average daily rainfall.	Prevailing direction of wind.
November	85.1	40.1	69.0	1st.	16.3	25th.	52.7	12.9	26.0	13th.	3.8	17th.	7	9	14	7	1.19	.040	S.
December	89.0	29.1	47.0	21st.	−5.5	8th.	52.5	13.5	38.5	7th.	4.0	27th.	8	15	13	13	1.79	.058	W.
January	84.4	25.0	58.0	30th.	−7.0	12th.	60.0	17.3	43.0	24th.	1.8	28th.	8	13	15	20	2.90	.093	S. W.
February	83.2	27.9	72.0	16th.	6.0	1st.	66.0	19.6	37.0	16th.	9.5	11th.	5	8	15	14	5.81	.207	N. W.
March	83.2	32.6	68.0	18th.	3.0	20th.	65.0	20.3	39.0	18th.	6.8	11th.	9	13	9	12	2.87	.093	N. W.
April	74.4	48.7	86.5	14th.	22.0	3d.	64.5	24.6	42.8	17th.	9.0	1st.	8	13	9	12	2.98	.099	N. W.
May	82.0	61.0	86.0	8th.	34.0	22d.	52.0	27.4	43.0	7th.	9.0	22d.	7	16	8	14	5.76	.186	S. W.
June	85.0	67.8	88.0	18th.	43.0	1st.	45.0	23.6	36.0	2d.	14.0	10th.	11	13	6	15	4.70	.156	S. W.
July	79.0	71.7	94.5	22d.	46.0	10th.	48.5	26.2	39.0	31st.	17.0	8th.	15	15	1	11	2.92	.094	S. W.
August	77.6	67.2	97.0	22d.	44.0	30th.	53.0	30.3	41.0	21st.	13.5	28th.	15	13	3	7	2.12	.068	N. W.
September	79.6	61.5	93.0	15th.	34.0	9th.	59.0	25.6	45.0	11th.	9.0	17th.	10	12	8	11	3.18	.104	N. W.
October...........	85.2	53.2	85.0	9th.	32.0	16th.	53.0	17.4	36.0	9th.	5.0	26th.	6	9	16	12	4.34	.140	N.
	82.8	48.7	97.0	22d. Aug.	−7.0	12th. Jan.	104.0	21.6	45 0	11th. Sept.	1.8	28th. Jan.	99	149	117	148	40.51	.111	

SUMMARY OF MONTHLY REPORTS FOR YEAR.

Mean relative humidity	82.3 per cent.	Number of clear days..............................	99
Mean temperature..............................	48.7°	Number of fair days..............................	149
Highest temperature..............................	97.0° August 22.	Number of cloudy days..............................	117
Lowest temperature..............................	−7.0° January 12.	Number of days on which rain fell	148
Range of temperature..............................	104.0°	Total rainfall..............................	40.51 Inches.
Mean daily range of temperature..............................	21.6°	Mean daily rainfall..............................	.111 "
Greatest " " "	45.0° September 11.	Prevailing direction of wind..............................	S. W.
Least " " "	1.8° January 28.		

REPORT ON WEEDS.

Of the 1,500 species of flowering plants found in the State of Ohio, 182 are more or less troublesome weeds. That is, they are plants of no special value themselves, and are frequently an injury to the cultivated crops. They usually appear as the result of neglect. Wherever land is not occupied with something good, something positively bad is very likely to take its place, and when these intruders are once fully established they are not disposed to yield without a struggle. Weeds are introduced upon our farms in a variety of ways. They often come in seed that is sown. Again many of the seeds of our weedy plants are well provided with some natural means for their distribution. Some that are most noxious seem to have special contrivances to aid their dispersion, being provided with hooks, awns, barbs, wings, tufts of fine silky hair, etc.

Besides this there are other things that aid. The immense number of seeds produced by each plant; the prolonged vitality of these seeds; the wind and other forces of nature that are constantly at work—all assist in widely scattering and perpetuating our troublesome enemies.

In addition to this rapid multiplication of seed, quite a number of our weedy plants reproduce themselves very readily from cuttings of the root or underground stem. With such plants cultivation sometimes tends to increase rather than diminish the number. Weeds then are useless plants, usually of a very vigorous and hardy character, producing large quantities of seed, or multiplying very rapidly by cuttings.

How may our most troublesome weeds be cheaply and certainly destroyed? To this question no definite answer can be given. There is no royal method of killing weeds. Their destruction means work. The way to kill weeds is to kill them. The following general rules will, if adopted, prove serviceable:

1. *Take every precaution to prevent your land from becoming seeded.*
2. *If seeded kill the weeds before they come up. Never allow them to breathe.*
3. *If they do come up, never allow them to blossom.*

The weeds of the State may be divided into three grades or classes—

1. Weeds that are universally injurious. Those belonging to this class number about 40.

2. Weeds that are usually troublesome. Under this head we have 55 species.

3. Weeds that are only occasionally troublesome. Of these we have 87.

The greater number of our worst weeds are not natives of this country, but have come from Europe.

The following table will show the proportion of native and introduced species:

	Native.	Introduced.	Total
Class 1	5	35	40
Class 2	20	35	55
Class 3	42	45	87
Total	67	115	182

In December, 1883, the following circular was issued, and thirteen hund copies sent to the farmers and gardeners throughout the State, principally the crop correspondents:

CIRCULAR 2.

Ohio State University, Columbus, *December* 3, 1883.

Dear Sir: Will you please fill out the following blank, as far as you are a and return the same in the enclosed envelope at your earliest convenience:

Give all the common names by which you know the weeds, also the scientific name if can. If you need more room, write on the other side.

1. What weed is most troublesome in *corn?*
2. What do you know of its introduction and history in your locality?
3. In what kind of soil does it thrive best?
4. What is the cheapest and best method of destroying it, and is this method any other, generally adopted in your section of the State?

Answer the same questions with regard to *wheat.*

1. Name of weed?
2. Introduction and history?
3. Soil?
4. Means of destroying?

Answer the same questions with regard to *meadows and pastures.*

1. Name of weed?
2. Introduction and history?
3. Soil?
4. Means of destroying?

Answer the same questions with regard to *garden crops.*

1. Name of weed?
2. Introduction and history?
3. Soil?
4. Means of destroying?

Give below a list of the most troublesome weeds in your locality, not named ab stating *where* and *how* they do their greatest injury:

Name.	Where found.

Your name ...., P. O. ...., County ....

There were returned three hundred and thirty-four copies of this circular, with the *first* and *fourth* in each set of questions pretty generally answered. Questions *two* and *three* were in a majority of the papers left blank. These were from all counties of the State except four, viz: Clinton, Marion, Montgomery and Vinton.

For convenience the State was divided into seven sections corresponding to Klippart's Agricultural Map, as follows: Muskingum Valley, 15 counties; Hocking Valley, 8 counties; Scioto Valley, 15 counties; Miami Valley, 14 counties; Maumee Valley, 18 counties; Western Reserve, 12 counties; River counties, 4 counties.

In *corn*, the Rag- or Bitter-weed (*Ambrosia artemisiæfolio*) was reported most troublesome by the greatest number, 167 correspondents. It has been found in cultivated fields and waste places since the earliest settlements, is probably native, and thrives equally well on all soils. The means of extermination employed by the best farmers is careful hoeing in cultivated crops, and frequent mowing of all waste places, pastures, and stubble fields, permitting none of the plants "to go to seed." The smoothing harrow should be used as soon as the corn is up. This weed is so widely and abundantly distributed as to be expected each year, and for some reason its eradication is too often neglected.

The Fall, or Pigeon grass (*Setaria glauca*) was reported as the worst weed by the next greatest number (97), and from the Western Reserve nearly as many reported this the worst, as did the Rag-weed. Although this weedy-grass is supposed by many to be indigenious, such is not the case. It was introduced from Europe with the earliest seetlers, and is still moving westward. It thrives in all situations, but seems to prefer a moderately dry, sandy soil. It is annual, and if cut off at the surface of the ground is killed, hence light, but thorough cultivation is the best means of getting rid of it. Stirring the soil before it appears above ground is recommended; also heavy manuring. Among the names, besides the above, under which it is known are Summer, Bottle, Barn, Fox or Fox-tail grass and Bristly Foxtail.

The Clot or Cockle-bur (*Xanthium strumarium*) comes next in the list of the most troublesome, and is found probably native along all the streams of the State on damp, alluvial soils. Seeding down to clover and meadow grasses, and mowing the weeds off several times the first season appears to be the best practice for its destruction.

The Spanish Needle (*Bidens bipinnata*) is a native, thriving on most soils. It does best in those of a clay composition. It is most troublesome late in the season, after the corn is laid by. Seeding down is practiced in some sections as the best means of eradicating it.

A few correspondents reported the following as most troublesome in corn: The Morning-glory or Bind-weed, (*Calystegia sepium,*) on the alluvial soils along the rivers. It can be eradicated only by the hoe and hand-weeding. Deep plowing in mid-summer is partly effectual, and hogs will sometimes clean a great many of the roots from the ground. The Smart-weed (*Polygonum hydropiper*) is found on wet, rich soils, where underdraining proves beneficial.

Crab- or Finger-grass, (*Panicum sanguinale*) and Twitch-, Quitch-, Quick- or Couch-grass (*Triticum repens*) are quite troublesome weeds, the former from Europe, the latter native, are found generally distributed on good land. Repeated thorough deep stirring of the soil during hot weather will destroy them.

The Red or Sheep-sorrel (*Rumex acetosella*) is found only on poor and sour soils. The application of fertilizers, especially of lime, ashes or potash salts, is the proper treatment.

Pig-weed, (*Chenopodium album,*) Red-root or Hog-weed, (*Amarantus retroflexus*) and Jute, Velvet-leaf or Butter-print (*Abutilon avicennæ*) should be kept down by cultivating the corn as late as possible.

Out of two hundred and seventy-nine reports on weeds most troublesome in *wheat*, one hundred and thirty-seven placed the Rag-weed first, the greatest proportion to other weeds being in the Maumee valley, the least proportion on the Western Reserve. It is troublesome only where the wheat stands thin upon the ground, and in the stubble after harvest. In the former case a bette preparation of the ground, with higher manuring and top dressing is practiced with the required result; in the latter, mowing, not permitting them to mature their seed.

Corn-cockle (*Lychnis Githago*) is considered by many as most troublesome, and where there is a good stand is probably the worst weed with which the wheat-growers all over the State have to contend. It appears least troublesome in the Maumee valley, and most so on the Western Reserve. It is but a few years since apparatus for screening wheat have been so perfected as to remove all the seeds of cockle, and it has therefore been scattered from its home in Europe to all parts of the world where wheat is cultivated. The only way to free the fields from it is to sow nothing but seed that is perfectly cleaned, and pull out by hand all plants that come from seeds already in the ground.

Chess or Cheat, (*Bromus secalinus,*) also a native of Europe, has found its way into nearly every farm where wheat is grown, but on good land, well seeded, does but little harm, as the wheat will then keep it down. If the wheat should be eaten off by poultry or stock, or killed by the fly, it springs up on the land thus made bare, but the wheat does *not* change to cheat, as many have said. Besides being sowed broadcast with the wheat, it was some years ago advertised as a new and valuable grass, under the name of "Willard's Grass." It is very prolific, large plants producing as many as three thousand seeds, many of which will remain in the ground several years without losing their vitality, then on being brought near the surface germinate and grow if not crowded out by stronger plants. Manuring, underdraining and sowing clean seed are recommended as the best means of eradicating it.

Pigeon-weed, Red-root, Gromwell or Stone-seed, (*Lithospermum arvense*,) although not so generally distributed, is considered, in sections where it is found, a worse pest than Chess. In the central and western portions of the State, especially in the Miami valley, it is reported very bad. In the eastern and southern parts of the State it is not known. It has been introduced into some sections by birds, but principally by sowing wheat, barley or oats containing the seeds. In a sample of wheat from Italy examined here last fall were found a number of seeds of this weed. Although when crowded it will blossom and produce seeds at a few inches in height, it is in good soil with plenty of room, quite prolific. A plant from a clover field on the University farm was found to produce 7,000 seeds. Putting the land in hoed or cultivated crops is most generally practiced as a means of extermination.

In *meadows and pastures* there were received 290 reports, enumerating 20 varieties of weeds. There were 91 who reported the Flea-bane or White weed (*Erigeron annuum*) worst. It is found most abundant along the river bottoms of Southern and Central Ohio. It is a native, found mostly in rich soils. Mowing early, just before or while in blossom, is most generally practiced as a means of extirpation. Plowing and putting in a rotation of hoed crops, and pasturing with sheep are advised by some.

The Rag weed is, in the northern part of the State, more troublesome than the White weed. Plow up and cultivate thoroughly for a year or two, then seed heavily; frequent mowing is also effectual in ridding pastures of the pest.

No other weed is so annoying in the Western Reserve and Maumee Valley as the common Plantain (*Plantago major*), and few are so difficult to weed out. It is a perennial, and its numerous fibrous roots hold it firmly in the soil. It is a native of Europe and Japan, but is now wide-spread throughout the United States, thriving most vigorously on moist, rich lands of a clay nature. Sheep will eat it, and close pasturing is occasionally practiced as a means of extirpation. Repeated close cutting is also recommended, but is not effectual. Several years in carefully cultivated crops is the best, where the ground can be so employed. Where this can not be done, the only effectual means of destroying is cutting the plants up just below the surface of the ground. This is best accomplished with a narrow, light hoe, or a light, chisel-like spud.

White or Ox-eye Daisy (*Leucanthemum vulgare*) is very pernicious, spreading rapidly over the State. It is a native of Europe, introduced into Southern Ohio as a grazing plant for sheep. In the northern part of the State it came in hay with emigrants, and in grass and clover seed. It has been cultivated in gardens in many places, and has escaped into the fields. It thrives on all soils and under all conditions, and has to be contended with in all situations. Mowing as it comes into flower, and rotation of hoed crops are much practiced where it is best known. In those districts where it is not yet abundant the most economical means of eradication is the hoe as recommended for Plantain.

In the river valleys, especially in the clay loam and alluvial soils of the Miami and Scioto Valleys the Iron weed.(*Vernonia Noveboracensis*) is considered by many as the most troublesome weed they have in meadows and pastures. It is a native, but confined almost entirely to low, rather wet ground, hence underdraining is practiced with good results. Clean cultivation with corn one season will kill all the roots in the ground. Mowing, to be effectual, must be done quite often throughout the summer.

Meadows and pastures having Sheep Sorrel in them should be treated with an application of fertilizers as on corn land.

The common or Bull Thistle (*Cirsium lanceolatum*), although a native of Europe, has spread over the United States almost as rapidly as civilization, having little choice as to soil, but thriving equally well in all situations. It should never be allowed to ripen its seed, as they are carried by the wind to all parts for miles around. It should be destroyed in spring or early summer, before blooming, by cutting off just below the surface of the ground with a narrow hoe or light, sharp spud.

Yarrow (*Achillea millefolium*), also a native of Europe, where it is regarded as of some value as a pasture plant, is thoroughly naturalized in this country, and regarded here as a noxious weed. It is found generally distributed throughout Ohio, but is most abundant in the Muskingum, Hocking, and Scioto Valleys. Careful mowing is the only means much used to eradicate it.

The Yelow, Sour, or Narrow Dock (*Rumex crispus*) is European. It is most troublesome on low, wet land. The frosts of winter often throw it out of the ground sufficiently to make it easy to pull up by hand in early spring.

Wild Carrott (*Daucus carota*) and Mullein (*Verbascum thapsus*) are both natives of Europe; fields can be kept free of both by a little care and use of the narrow hoe.

There is a greater variety of weeds found in the *vegetable garden* than any other place on the farm. There are, however, but half-a-dozen that are very troublesome, and of two hundred and forty-seven reports, one hundred and fourteen named Purslane (*Portulacca oleracea*) as being the worst. Like many of our most troublesome weeds, it is a native of Europe. It was introduced a long time ago, and has become so widely disseminated and thoroughly established that it has been thought by many to be indigenous. If given a chance it will grow any place, but prefers the rich, mellow soil found in most gardens.

It ripens its seed in a very short time after flowering, and should therefore be cut up while small. It makes a very good pot herb, and small gardens may be kept free of them by pulling and using them for that purpose. It is an annual, its seeds possessing great vitality, and each time they are permitted to mature, the weed may be expected to appear for several years after. Pigs are quite fond of it, and it may be cut and fed to them with profit. Nothing but thorough cultivation with the garden, and wheel-hoe can be relied upon to extirpate it.

The Rag-weed is also quite bad in the gardens of the Western Reserve and Maumee valley. The plants are too often permitted to mature their seed after the garden crops are removed, and thus cause trouble the next year. The weeds should be kept down all the season. The same is true of Pigeon-grass, which is annoying the gardeners of the Western Reserve and Muskingum valley.

The Chickweed (*Stellaria media*) is quite a pest in the river counties, the Western Reserve and Muskingum valley. It is a native of Europe. It is confined almost entirely to damp, cold soils; underdraining would therefore be one of the best means of getting rid of it. The addition of lime to the soil is also beneficial.

Common, Low, or Marsh-Mallow, or Cheeses (*Malva roundifolia*) is also very troublesome. It is European in its origin. It grows as thriftily on one kind of soil as another, providing there is sufficient plant-food. The garden hoe is the best implement with which to destroy it.

Other weeds with which the gardener has to contend are: Pig-weed, Joint-grass, Red-root, Sorrel, Twitch-grass, Spanish-needles, Plaintain, and Butter-print, all of which are spoken of elsewhere in this report.

In order that the methods and practices of the best farmers of the State may be more generally understood, it is respectfully urged of those into whose hands this report comes, that they communicate with the Station upon this important subject of the weedy plants of the farm and garden, giving and receiving such informatien as may be mutually beneficial, especially concerning plants that are new or of recent introduction.

THE IDENTIFICATION AND DESCRIPTION OF GRASSES AND OTHER PLANTS.

The following is a partial list of the grasses, weeds, and other plants identified at the Station during the past year. In most cases a carefully prepared description of the species was given, with the name. Besides those here enumerated, about seventy-five species of other grasses and twenty-five spe of other plants were identified :

COMMON NAME.	SCIENTIFIC NAME.
Buckwheat Tree	*Mylocarium ligustrinium* W
Vetch. (Tares.)	*Vicia sativ*
Lupine	*Lupinus perenni*
Sensitive Pea	*Cassia chamæcrist*
Bean Capers	*Kallstrœmia maxim*
Silk Weed	*Asclepias Michauxii* Dec
Evening Primrose	*Œnoth*
Showy Orchid	*Orchis spectabili*
Water Leaf	*Hydrophyllum appendiculatum*
Matrimony Vine.	*Lycium vulg*
Gaura	*Gaura bienni*
Blue Vervian	*Verbena hastat*
Bath Flower	*Trillium erectu*
Hounds Tongue	*Cynoglossum officinali*
Wild Carrot	*Daucus carot*
False Wild Carrot	*Daucus pussillus*
Horse Balm	*Collinsonia Canadensi*
Peppermint	*Mentha piperit*
Wild Bergamot	*Monarda fistulos*
Common Cone-Flower	*Rudbeckia laciniat*
Yellow Daisy	*Rudbeckia hirt*
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Many-flowered Aster	*Aster multifloru*
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Marsh Grass	*Spartina polystachya* W
Panic Grass	*Panicum virgatu*
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Periwinkle	*Vinca mino*
Wood-rush	*Luzula campestris*

REPORT ON INSECTS.

In order that the Station might gain some idea of the distribution and number of noxious insects in different parts of the State, and learn something about the methods employed to counteract them, the following circular was prepared and quite generally distributed:

OHIO STATE UNIVERSITY, COLUMBUS, *December* 3, 1883.

DEAR SIR—Will you please fill out the following blank as far as you are able, and return the same in the enclosed envelope, at your very earliest convenience:

Give the common names by which you know the insects, also the scientific name, if you can.

1. What insect is most troublesome in *corn?*
2. What do you know of its introduction and history in you locality?
3. What do you consider the most practical remedy, and what means are generally adopted for preventing its ravages?

Answer the same questions with regard to *wheat.*

1. Name of insect?
2. Introduction and history?
3. Most practical remedy?

Answer the same questions with regard to the *large fruits.*

1. Name of insect?
2. Introduction and history?
3. Most practical remedy?

Answer the same questions with regard to the *small fruits.*

1. Name of insect?
2. Introduction and history?
3. Most practical remedy?

Answer the same questions with regard to vegetable garden crops.

1. Name of insect?
2. Introduction and history?
3. Most practical remedy?

Have the following insects increased or diminished in your locality during the past two or three years?

1. The Hessian fly?
2. The potato beetle?
3. The currant worm?
4. The cabbage worm?

Write a list of what you regard as the most troublesome insects, not including those named above, stating the crop they most injure, and the best remedy, if any:

NAME.	CROP.	REMEDY.
....	....	....
....	....	....
....	....	....
....	....	....

Your name.............................. P. O.............................. County..............................

Three hundred and fifty-two of those receiving the blanks filled them out and returned them to the Station. The answers to the question, "Have the following insects increased or diminished in your locality during the past two or three years?" are given in the table below. A few correspondents in each section of the State reported that there had been neither an increase nor diminution of the insects enumerated, but the number remained about the same. In the column under "increased" is given the number of correspondents reporting an increase of the insect; under "decreased" the number reporting a decrease. Each section of the State here given includes the same counties as the corresponding sections given in the report on weeds.

INCREASE AND DECREASE OF INSECTS.

Locality.	Hessian fly, *Cecidomyia destructor.*		Currant worm, *Nematus ventricosus.*		Col. potato beetle, *Doryphora 10-lineata.*		Cabbage worm, *Pieris rapæ.*	
	Increased.	Diminished.	Increased.	Diminished.	Increased.	Diminished.	Increased.	Diminished.
River counties	5	10	9	5	....	19	11	5
Muskingum Valley	14	24	37	9	....	59	30	19
Hocking Valley	15	2	9	3	1	18	13	3
Scioto Valley	30	14	39	8	....	54	30	14
Miami Valley	32	9	22	13	....	47	25	12
Maumee Valley	13	21	27	9	....	41	20	14
Western Reserve	10	50	29	29	2	66	36	19
Totals	119	130	172	76	3	304	165	86

Although the Hessian fly is somewhat periodical in its appearance, it has evidently been moving within a few years past from the north and east of the State, where it has decreased rather more than increased, to the south and west, where it has increased quite rapidly.

The species of Currant worm that is the most destructive in Ohio is the imported one (*Nematus ventricosus*). It must not be forgotten, however, that there are two native species found in the State. It is probable that some of the reports were upon one of these; but as no particular species was mentioned and as the imported one is much more prevalent, all the reports were considered as referring to this. As a rule it has increased all over the State. From the Western Reserve, however, as many report a decrease as an increase. This decrease is accounted for by the fact that the bushes are nearly all killed.

The Colorado potato beetle is rapidly disappearing from the State, and those that remain do but slight damage to the potato crop. At the present rate of decrease it will be but a few years until they entirely disappear.

There are several species of Cabbage worms at work in the State, but the one that is increasing most rapidly and is the most destructive was imported into Canada in 1859, and is known as the Rape or Cabbage butterfly (*Pieris rapæ*). It is found in all parts of the State.

INJURIOUS TO CORN.

CUT WORMS.

Probably no other insect is so widely distributed and generally destructive to Indian Corn as the cut worms, of which there are several species, belonging to the genus *Agrotis*. They are commonly known as the black, brown and striped cut worms. The larvæ are from one to two inches long, of various shades of brown, from light ashen gray to almost black, with a faint lighter stripe along the back. They are smooth and have a greasy appearance. The mature insects are moths, usually flying at night or on cloudy days. Their wings expand from one and one-fourth to two inches, are of various shades of gray and brown, the under pair lighter. The eggs are deposited mostly late in the summer, close to the ground upon plants. Soon after they hatch the young larvæ enter the ground where they remain all winter, feeding upon the tender roots of plants at first, but going deeper and remaining torpid during cold weather. Coming forth in the spring they attack almost any tender plant, feeding by night and hiding during the day. When fully grown they enter the ground, form earthen cocoons and in late summer appear as moths.

Remedies.—Late fall plowing, thus exposing the larvæ to the frost and birds. Thorough summer fallowing will destroy nearly all there are in a field. When they are at work a very effective remedy is to make holes in the ground with a pointed stick, then the next day kill those that have secreted themselves in the holes. They can usually be found hiding near where they have eaten off a plant. Wherever it is found that the cut worm is in the field to be planted more seed should be used than would be otherwise required.

MAY BEETLE.

The June Bug or May Beetle (*Lachnosterna fusca*), is not only destructive to corn, but feeds also upon potatoes, roots of strawberry plants, roots of grasses and other plants. (See Report for 1882). It is most apt to be troublesome on land that has laid long in pasture or meadow. It is most abundant in the Muskingum and Maumee valleys.

Remedies.—Fall plowing; some have a boy follow the plow and gather the grubs. The crow and the skunk are fond of them and destroy a great many, if not disturbed. The beetles may be entrapped by placing in the field several tubs or half-barrels with two or three inches of water in the bottom, and hanging a lighted lantern over each at night. A little kesosene put on the water makes it more effective.

WIRE WORM.

Next to the White Grub in point of destructiveness to corn is the Wire Worm (*Elaters*). It seems to be most troublesome on the Western Reserve

Remedies.—In addition to those given last year, underdraining, summer fallowing and smoking the seed are recommended.

CORN WORM.

The Corn or Boll worm (*Helicthis armigera*), is the well known cotton worm of the southern States. It attacks corn in the ear, feeding upon the silk and corn. It usually does most damage to corn when in a green state, but it has been known to subsist on mature corn. Its ravages, at the Station, last season were confined to early varieties of sweet corn, rendering about one-fourth of the ears unsalable. But few ears could be found of the Early Marblehead variety that were uninjured. The worms were first observed July 23, and had nearly disappeared by August 1, so that late varieties of corn escaped. In some sections they have injured tomatoes by eating into and causing them to rot. The worms or larvæ vary much in size and color, often so much that they might be mistaken for different insects. When young they vary from green to brown. They agree, however, in being marked with light and dark longitudinal lines, and are covered with black spots, from which hairs arise. The full grown worm is from one inch to one and one-fourth inches in length. Having attained full size it forms a sort of cocoon several inches below the surface of the ground. It remains three or four weeks in the chrysalis state, when the moth emerges. The moth is pale yellow in color, the front wings being darker than the hind wings. The hind wings have a marginal dark brown band, and each wing has a dark spot near the middle. The moth flies at night, hence is not often seen.

Remedies.—No efficient plan can be proposed for combatting this pest. Fires at night have been tried, also lanterns suspended above water, so that the moths striking the lantern will fall into the water. These plans, however, can be used on a small scale only.

Several species of birds are known to take the worms, among these are jays, wood peckers and crows. Turkeys are also very fond of them.

Some insects aid somewhat, notably, ants. Several of these have been seen to attack and kill the worms. In many parts of the State it will, perhaps, be necessary to discontinue growing the early varieties of corn, but in some sections even this plan will avail nothing, as late corn is also attacked.

STALK BORER.

The Corn Stalk Borer, Heart, or Spindle worm (*Gortynai zeæ*) is quite destructive in the southeastern part of the State. The eggs are laid upon the stalks early in summer. As soon as they are hatched the larvæ eat into the stalk and destroy the pith. In the latter part of July it comes out and enters the ground, where it changes to the chrysalis or pupa state. In September it emerges from the ground a perfect insect. The upper wings are rust-red with gray markings, the lower are grayish with dusky spot and bands. It expands about an inch and a half.

Remedies—The only way to prevent the ravages of this insect is to destroy the larvæ. These should be sought out and killed wherever the withering stalks show their presence.

INJURIOUS TO WHEAT.

HESSIAN FLY.

The Hessian fly (*Cecidomyia destructor*) is the only insect that is very destructive to the wheat crop in Ohio. A description of it with its history and the remedies recommended may be found it the Report of the Station for 1882.

INJURIOUS TO LARGE FRUITS.

CODLING MOTH.

The Apple worm or Codling moth (*Carpocapsa pomonella*) is most injurious to the fruit of the apple. A full report of this noxious insect is given in the Report for 1882.

The Curculio, Round headed Borer, Flat-headed Borer, Canker worm, and Tent Caterpillar, are still deserving of attention and require careful, persistent work to be kept in check. They are regarded as troublesome in the order named, the first being worst, the last named least troublesome. For description and remedies see Report for 1882.

INJURIOUS TO SMALL FRUITS.

CURRANT WORM.

The currant and gooseberry, of all the small fruits, suffer most from the ravages of noxious insects, and of these the Imported Currant worm (*Nematus ventricosus*) most demands attention. The Hocking Valley and some counties bordering on the Ohio River are the only places where other insects are considered very troublesome to small fruits. It has been less than thirty years since the Currant worm was brought to this country, but it is now found generally distributed throughout the Middle, Eastern, and many of the Western States. It was first seen in Ohio about fifteen or eighteen years ago, and is now abundant in all parts of the State. A description is given in the Report for last year.

Remedies—Besides the application of white hellebore as reported last year, the following are recommended: Paris green, London purple—there is danger of poisoning from using these two—carbolic acid, whale oil soap, kerosene emulsion, and copperas water. Nothing is so effective and so generally recommended as white hellebore.

CURCULIO.

Although not generally classed as small fruits, the plum and cherry have been so considered in the reports from correspondents. The Curculio or Plum Weevil (*Conotrachelus nenuphar*) is the only insect that is generally destructive. The remedies that are recommended are enumerated in the last Report.

For description of and remedies for the Rose bug and Strawberry Leaf-roller, enumerated with the insects of small fruits, the reader is referred to the Report of last year, 1882.

GRAPE-BERRY MOTH.

Another insect that is quite destructive to the grape in many sections is the Grape-berry moth (*Eudemis botrana*), often appearing and doing great injury where it had previously been unknown.

The first appearance of the affected grapes is somewhat the same as that of the grape rot. The larva eats the pulp of the grape and portions of the seed, leaving but little except the outer skin.

Often, where one grape is destroyed, the worm fastens the already ruined grape to a sound one, by means of silken threads, and burrows in it in the same manner.

The moth, which lays its eggs on the young grapes, is nearly one-half an inch across the spread wings. The fore wings are of a bluish shade with a metallic lustre; the hind wings are brown.

When the larva attains full size, a cocoon is formed upon the leaves of the vine. In about ten days from the time the chrysalis is formed the moth appears. It is believed that the second brood passes the winter in the cocoon.

All varieties of grapes are attacked, but those with compact bunches and thin skins suffer most.

Unfortunately no good remedy is known. If the fallen leaves and wormy berries are destroyed some good may be accomplished.

STRAWBERRY CROWN-BORER.

The Strawberry Crownborer (*Tyloderma fragariæ*) has done much harm in some sections of the country, but has not yet become very troublesome in this State.

The beetle is dark brown in color, and about one-sixth of an inch in length. The eggs are laid in the crowns of the plants in June or July, and as soon as hatched the larva burrows into and destroys the plant. The larva is about one-fifth of an inch in length, white, with a yellow head. It completes its transformations within the root of the plant, and the beetle escapes sometime in August.

Remedies—Where this insect becomes very troublesome the only remedy is to plow up the beds as soon as the fruit is gathered, for if left a second year the bed will be worthless. When first discovered all infested plants should be dug and burned.

INJURIOUS TO THE VEGETABLE GARDEN.

The number of species of insects infesting the vegetable garden is quite large, but there are only half-a-dozen that deserve special notice, and most of these were fully described in the last report. Some, however, deserve further mention.

CABBAGE WORM.

The cabbage butterfly, green or cabbage worm (*Pieris rapæ*) is the worst. This pest is increasing in nearly all parts of the State. In addition to the remedies recommended last year, the following are given: Kerosene emulsion, ashes, white hellebore, solution of salt-peter, bran, and road dust. Pyreth rum or Persian insect powder has been found the most effective of anything yet tried at the station.

POTATO BEETLE.

Although mentioned by the second largest number of correspondents as their worst pest in the garden, the appearance, habits, and manner of treating the Colorado potato beetle (*Doryphora* 10-*lineata*) are so well known that it scarcely need be mentioned. As soon as the insects make their appearance, Paris green or London purple should be applied, either in solution or mixed dry, with plaster or some such material, so that it can be evenly distributed over the plants in sufficiently small quantities.

FLEA BEETLE.

The striped or black turnip beetle, cabbage flea, or flea beetle (*Haltica striolata*) is very destructive in hot, dry weather to the turnip, cabbage, radish, and in fact all plants belonging to the natural order *Cruciferæ.* Not only does the beetle feed upon the leaves eating small holes through them, and sometimes entirely destroying the seed leaves, but the larvæ feed upon the roots of the plants.

Remedies.—The application of fine ashes, soot, plaster or air-slaked lime while the plants are wet with dew. The application of soap suds or manure water to the roots is also recommended.

ONION FLY.

Although not widely distributed, the onion fly (*Anthomyia ceparum*) is quite troublesome in some parts of the State. The fly commences laying eggs in May or June, on leaves near the surface of the ground. The eggs soon hatch and the larvæ burrow in the young onions causing them to rot. In about four weeks the transformations are completed, and a new brood appears. The flies of the second brood usually lay their eggs upon the bulb instead of the leaves.

Remedies.—Numerous remedies have been tried, such as soot, kerosene oil mixed with about one hundred times its bulk of water and applied with a sprinkler, salt at the rate of three bushels per acre, and hot water poured over the affected onions. The most effectual plan is to dig and burn the onions that have been attacked. This plan can be easily practiced if commenced when the pest first appears.

UNPUBLISHED REPORTS.

For lack of space the Station notes and observations on grasses, forest tree culture, and other miscellaneous tests and experiments do not appear in this report. Many chemical analyses that are only of local interest have also been omitted. The results of all investigations of general interest not yet published will appear in the agricultural journals of the State during the summer.

DIRECTIONS FOR SENDING SAMPLES AND SPECIMENS.

SENDING PLANTS FOR IDENTIFICATION.

Grasses, weeds, or any other small plants may be sent by mail at the same rate as seeds. Plants for name should be sent while in blossom or fruit. Several specimens should be selected, and if possibie, the whole plant, including the root, should be gathered. With larger plants send plenty of the blossoms, fruit, or seed and leaves. These can be sent in boxes or securely tied in stout wrapping paper. Notes, stating where, when, and under what conditions the specimens were collected, should accompany each package by letter.

DIRECTIONS FOR SENDING INSECTS.

Insects may be sent by mail. The larvæ (worms, caterpillars, etc.,) should be put in a close tin or wooden box, and with them a supply of their appropriate food. No air holes are necessary. The greater the number of specimens sent the better. Perfect insects may be packed in cotton or paper and enclosed in small but stout paper boxes. A letter should be sent with each specimen, containing full notes of the habits and history of the insect as far as known, and the results of any experiments with different remedies.

AN AGRICULTURAL AND HORTICULTURAL MUSEUM.

It is the equal wish of the Station and the Agricultural Department of the State University to have a museum of agriculture and horticulture, always open and accessible to the citizens of the State. I earnestly solicit from farmers, fruitculturists, gardeners, and others, articles and materials illustrative of some branch of the above subjects. Samples of the different varieties of corn, wheat, oats, barley, and other grains; the seeds of fruit and forest trees, vegetables, and flowers, that are sound, pure, and true to name; specimens of grasses, weeds, and other small plants that may be of interest; sections of different varieties of wood; specimens of injurious or beneficial insects; samples of soil taken from different depths; all these, and many other things will be gladly received.

A museum of this character will supply a long felt want in the State, and I trust that we shall have your active co-operation in establishing it. Due credit will be given for all donations received.

Address:

William R. Lazenby, *Director*,
Columbus, Ohio.

TREASURER'S REPORT.

EMMETT MIX, IN ACCOUNT WITH THE OHIO AGRICULTURAL EXPERIMENT STATION.

RECEIPTS.

Balance on hand, March 17, 1883	$1,279 50	
Appropriation for 1883	5,000 00	
		$6,279 50

DISBURSEMENTS.

Salaries	$1,413 66	
Labor	1,357 82	
Equipment implements and apparatus	1,123 53	
Postage, printing, and stationery	331 45	
Expenses of Board of Control	95 35	
Express and freight charges	61 21	
Cash balance on hand	1,896 48	
		$6,279 50

MEMORANDUM.

This statement covers the expenditures from March 17, 1883, to March 10, 1884, inclusive. The Station has no outstanding liabilities. The estimated current expenses up to May 1, the end of the fiscal year, $1,038.25; for distribution of annual report, $300.00; for apparatus and equipment, $500.00. This leaves a balance of $58.23.

N. OHMER,
W. I. CHAMBERLAIN,
Auditing Committee.

EMMETT MIX,
Treasurer.

ERRATA.

Page 26, after bottom line, add 57½ to 62½ pounds.

Page 83, top line, after "nitrogen" read "it contains. In."

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All persons wishing subsequent publications of the Station, should acknowledge the receipt of this Report.

THIRD ANNUAL REPORT

OF THE

OHIO AGRICULTURAL EXPERIMENT STATION,

FOR

1884.

PRINTED BY ORDER OF THE STATE LEGISLATURE.

COLUMBUS:
MYERS BROTHERS, STATE PRINTERS.
1885.

OHIO STATE UNIVERSITY,
COLUMBUS, OHIO, *March* 1, 1885.

To Governor George Hoadly:

SIR: I have the honor to submit herewith the annual report of the Ohio Agricultural Experiment Station, for the year 1884.

I trust it will meet the approval of your Excellency and the General Assembly, and prove satisfactory to the farmers, for whose benefit the Station was established.

Very respectfully,

WILLIAM R. LAZENBY,
Director.

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BOARD OF CONTROL AND OFFICERS

OF THE

OHIO AGRICULTURAL EXPERIMENT STATION

STATE BOARD OF CONTROL:

His Exc. Gov. George Hoadly..E
William R. Lazenby..Di
Nicholas Ohmer, Dayton..Pr
W. N. Cowden, Quaker City..Se
Emmett Mix, Avenue..T

OFFICERS:

Director:

WILLIAM R. LAZENBY.

Chemist:

H. A. WEBER.

Superintendent of Field Experiments:

W. B. ALWOOD.

Botanist:

W. S. DEVOL.

Horticulturist:

W. J. GREEN.

GENERAL ANNOUNCEMENT.

The Ohio Agricultural Experiment Station was established in accordance with an act of the General Assembly, approved April 17, 1882, "for the benefit of the interests of Practical and Scientific Agriculture, and for the development of the vast agricultural resources of the State."

The experiments and investigations are carried on both in the field and laboratory, and deal with the following great agricultural interests, viz.: (1.) Grain Raising. (2.) Stock Farming and Dairy Husbandry. (3.) Fruit and Vegetable Culture. (4.) Forestry.

The Station is prepared to test varieties; to analyze and test fertilizers and manures, soils, waters, milks, cattle-foods, etc.; to examine seeds that are suspected of being unsound or adulterated; to identify and name weeds and other plants; to investigate and describe, when known, the habits of injurious and beneficial insects, and other work of a similar character that properly comes within its province.

It is the desire of the Board of Control to make the Station as widely useful as its limited appropriation will permit. To this end we earnestly invite the co-operation of the people and press of the State.

All communications on agricultural and horticultural topics will be fairly considered, and, as far as possible, promptly answered. Detailed reports of experiments, carefully and conscientiously made, will aid the Station in its work. Any citizen of Ohio, who is concerned in the promotion of agriculture, has the right to apply to the Station for any information it can render, and the Station will cheerfully respond to all applications, as far as lies in its power.

Samples of different varieties of corn, wheat, oats, barley, and other grains; the seeds of fruit and forest trees; vegetables and flowers, that are true to name; specimens of grasses, weeds, and other plants that may be of interest; sections of different varieties of wood; specimens of injurious and beneficial insects; these, and other articles and materials illustrative of any department of agriculture, will be gladly received.

Address all communications to

WILLIAM R. LAZENBY, Columbus, Ohio.

EXPERIMENT GROUNDS AND OFFICES

AT THE

OHIO STATE UNIVERSITY, NORTH HIGH STREET, COLUMBUS, O.

REPORT OF THE BOARD OF CONTROL.

To the General Assembly of the State of Ohio:

GENTLEMEN: The Board of Control of the Ohio Agricultural Experiment Station herewith submits to your honorable body the annual report of the Director, made to the Board at its regular meeting, held in Columbus, Feb. 9, 1885. We beg leave to call attention to this report, as one of the most complete yet issued, showing, as it does, that there is substantial advancement in the work of the Station. It is our equal wish and purpose that the Ohio Experiment Station shall rank second to none in the United States in usefulness.

To accomplish this end, more money must be placed at our command, for, as is well known, many of the most serviceable investigations and experiments require a large outlay of labor and material in order to be carried out successfully. The work of the Station has been conducted the past year, as heretofore, under the direction of Prof. William R. Lazenby and his able corps of assistants.

With their work and its results, both present and prospective, we are well pleased. The head-quarters and offices of the Station were in the rooms of the Chemical Laboratory until June 1st, when the Station moved to its more commodious and convenient quarters, in Horticultural Hall. In October, Prof. H. A. Weber, having been called to fill the Chair of Agricultural Chemistry in the State University, was appointed Chemist of the Station, in place of Prof. N. W. Lord, who had acceptably filled the position.

On the invitation of Hon. Homer Hamilton, United States Commissioner of Ohio, the Station sent, in care of Mr. W. B. Alwood, a fine collection of grains, grasses, etc., to the World's Industrial and Cotton Centennial Exposition at New Orleans. This exhibit will compare favorably with any other of like character, and is a good illustration of the Agricultural possibilities of our State. The work of the Station is increasing from year to year, as its usefulness becomes better known. We feel justified in asserting that, for the money expended, no public institution is doing more for the welfare of the citizens of our State. We respectfully invite your attention to the report of the Treasurer.

N. OHMER,
President of the Board of Control.

W. N. COWDEN,
Secretary of Board of Control.

THIRD ANNUAL REPORT.

INTRODUCTION.

The year of 1884 was characterized throughout Central and Southern Ohio by a severe and unusually long protracted summer drouth. Careful records kept at the Station, show that the total rainfall from the 28th of May until the 24th of September, was only four and one-half inches. This lack of moisture, occurring during the season of growth, completely ruined many farm and garden crops, and seriously injured others.

It is safe to assert that the average product of the farms of the southern half of the State (excepting the wheat crop) was little more than one half of a full harvest.

The lesson from this should be, to prepare for, and provide against such loss in the future.

Summer drouths are not unusual, though that of the past season was remarkable for its early commencement and extreme duration. The drouth proved disastrous to some of our field experiments, and the results of a part of the tests made are neither satisfactory nor conclusive. We simply report such observed or ascertained facts as are deemed useful, and draw such conclusions as the data in our possession will warrant.

The results of some tests have already appeared in the form of brief bulletins, the substance of which is republished in this report:

RULES AND REGULATIONS.

In order to systematize the work and increase the efficiency of the Station, the following rules were adopted by the Board of Control at the beginning of the year:

All laborers shall, upon the advice of the Director, be engaged by the officers of the respective departments in which they are to be employed. Every employe is expected to be diligent, and to do good, honest, faithful work, precisely as directed by those in charge.

Any one who does not know enough to do as he is told, or requires watching, will be promptly discharged.

The regular working hours shall be from 7 A.M. to 12 M., and from 1 P.M. to 6 P.M. Teams must be fed and properly cared for outside of these hours.

If necessary for experimental purposes, work may be required outside of the regular hours.

All causes of complaint shall be referred at once to the Director.

No money whatever shall be expended, or any debt contracted by any officer of the Station, without the advice and consent of the Director.

Copies of all letters, postal cards, or any written communication of an official character, must be made before such are sent from the Station, and all communications of importance should have the signature of the Director.

While each officer is expected to devise and plan some original investigations in his particular department, no new work shall be entered upon without the consent of the Director.

Each officer is expected to exercise proper courtesy to all visitors, and to do whatever work may be assigned him.

For the purpose of furthering the interests of the Station by judicious co-operation, there shall be a meeting of all the officers every Monday afternoon at half-past four o'clock.

DUTIES OF OFFICERS.

The following duties were assigned by the Board to the officers of the Station:

The Director shall have general oversight of all the Station work; shall attend to correspondence, referring letters of inquiry to the officer of the appropriate departments. He shall prepare the notes of observation, tests, and experiments for publication, and present a statement of the progress of the work of the Station at each regular meeting of the Board of Control.

The Superintendent of Field Experiments shall see that the laborers are assigned to their proper work each morning, and that they are prompt and faithful. He shall have entire charge of all the Station work outside of that hereafter assigned to the other officers. He shall make full and careful observations of all experiments, taking the proper notes on each, recording all facts of interest pertaining thereto, especially such as relate to the condition of the soil, temperature, etc., and their influence upon the crops being tested.

He shall keep the cash account books of the Station, pay all bills and accounts, preparing an itemized monthly statement of the same, to be accompanied with vouchers.

He shall do all the important scientific work, such as taking weights, measurements, etc., with his own hands, or under immediate personal supervision.

He shall be responsible for the care of teams, wagons, and all tools and implements belonging to the Station, none of which are to be used without his permission.

He shall be the meteorological observer, and keep the Station office rooms in good order.

The Superintendent of Field Experiments is expected to give his whole time to the Station, and every Monday morning shall submit his notes, and a carefully prepared summary of the previous week's work to the Director.

The Horticulturist shall have charge of all experimental work relating to fruit and garden vegetables; also such special work as may be assigned him by the Director. He is expected to take full notes of all work done in the gardens, to make observations concerning time of planting, germination, appearance of bloom, etc., of all varieties tested; to note the appearance, injury, and best remedies for insect enemies, weeds, etc., and to employ himself in carrying out the aims and objects of the Station, as far as they relate to horticulture. He shall report to the Director every Monday morning, making a brief summary of the work accomplished, and leaving his notes for examination.

The Botanist shall have charge of all tests of seeds, and shall name and describe such plants as are sent to the Station for identification. He shall also have complete charge of all museum specimens, and shall collect and preserve such samples and materials as may be useful in this way. He shall also have charge of the mailing list, and do such clerical and other work as may be assigned him from time to time.

The Chemist shall conduct such analytical investigations as may be laid out for him by the Director.

OBJECT AND PURPOSE.

The Ohio Agricultural Experiment Station was established "for the benefit of the interests of practical and scientific agriculture, and for the development of the vast agricultural resources of the State." Its purpose is to suggest practical improvement in farm and garden management, and to investigate, by scientific methods, such subjects as are of general agricultural interest. In short, the whole theory of the Station is to tell the farmers of Ohio what they most need to know.

The advantages it offers to the people of the State are clearly set forth in the general announcement on page 5.

SUMMARY OF YEAR'S WORK.

Field experiments with grains, grasses, fruit, and garden vegetables have been conducted as heretofore.

The primary object of these systematic and repeated tests is to improve upon the best known methods of cultivation and general management. Among practical questions, the following have received earnest attention: (1.) Comparative value of the best varieties. (2.) Effects of thick and thin seeding. (3.) Effects of sowing or planting at different dates, different distances, and different depths. (4.) The value of different methods of manuring and applying fertilizers. (5.) Comparative merits of different systems of culture, etc.

In connection with this work, chemical analyses have been made; experiments have been carried on in self and cross fertilization; investigations in regard to the best treatment of certain insect enemies and plant diseases, have been conducted; and the climatic conditions were carefully noted.

The work begun in practical forest tree culture has been extended. Some feeding experiments have been completed and others are still in progress.

TESTING THE VITALITY OF SEEDS.

This was a prominent feature of the work of the past season, and the results have been equally interesting and profitable. Over 1,200 samples of seeds were examined and tested during the year. The Station's efforts in this direction have brought about a decided improvement in the selection and preservation of seed corn throughout the State—thus averting a serious and annoying loss.

NAMING PLANTS AND INSECTS.

Numerous specimens of grasses, honey plants, weeds, etc , were received during the year for name and history. These have been identified and described at greater or less length. The Station has taken special care to give full and accurate information regarding the history, distribution, habits, and practical remedies for our most injurious insects and most troublesome weeds. Thanks are due all those who answered the circulars sent out for information bearing on these topics.

CORRESPONDENCE.

This continues to increase, and makes great demands upon the time of the officers of the Station. The letters received are mainly of inquiry, and come from all parts of the United States.

Every question asked has been carefully considered, and as far as possible, promptly answered. In the future such inquiries as are of general public interest, together with the answers, will be published in the form of bulletins.

STATION PUBLICATIONS.

Besides the annual report, the Station has, from time to time, published bulletins, circulars, and notes, which were extensively copied by the agricultural press. These publications have been eagerly sought for, the demand being much greater than the supply.

It is plainly the duty of the Station to give all those who are interested in its work an opportunity to learn what is being done. During the year brief bulletins will be issued more frequently than heretofore.

ACKNOWLEDGMENTS.

The Station extends thanks to its numerous friends who have kindly remembered it by donations of seeds, plants, implements, reports, etc.

Every gift of this character, however slight, has been fully appreciated by those in charge, and has added something to the efficiency of their work.

The Station is also grateful for the friendly counsel and co-operation that has been so generously rendered. The good will of the Trustees, President, and Faculty of the Ohio State University has been constantly manifested, and a spirit of harmony has existed between the Station and all the departments with which it is so intimately connected.

CONCLUSION.

The fairest test of successful agriculture is a steadily increasing yield of products at a minimum cost of production. The Station desires to make the road to success in farming somewhat easier than it is. It does not aim to do the real work of the farmer or gardener. Its office is to bridge over difficulties, to incite to careful observation, and painstaking effort. It desires to have the results of its labors, not thoughtlessly accepted, but studiously considered.

In accordance with this purpose, the Station issues its third annual report, trusting that it will prove a lasting benefit to the agricultural interests of the State.

WILLIAM R. LAZENBY, *Director.*

WHEAT EXPERIMENTS.

The series of tests in wheat culture, inaugurated in the fall of 1882, hav been continued, with some additions and changes, the main features of th work remaining the same. The harvest of 1884 is the second experiment wheat crop, and the fourth successive crop of wheat that has been grown upo the same land. Any extended description of the experimental field is uncalle for, as it has been fully described in a previous report. The following not will suffice:

The field is a parallelogram, cut into two equal parts, lengthwise, by a driv way. Upon either side of this lie the larger plots. These are of such leng that one drill width is exactly one-thirty-second of an acre, or two drill width one-sixteenth of an acre. The soil is a light clayey loam, resting on a gravel subsoil. It is nearly uniform throughout.

The principal wheat tests may be classified as follows, and will be treated the order named:

I. *Comparative test of varieties.*
II. *Cross-fertilization and selection.*
III. *Thick and thin seeding.*
IV. *Winter protection and spring cultivation.*
V. *Early and late plowing and sowing.*
VI. *Application of fertilizers.*
VII. *Methods of seeding.*

COMPARATIVE TEST OF VARIETIES.

For three successive years a large number of varieties have been tested o small scale. This year the list embraces one hundred and twenty-four, inclu ing all the old and new sorts that could conveniently be obtained.

Out of this large number of so-called varieties which the Station has teste only a few well-marked types can be discerned.

Around these, when the list has been more fully extended, an effort will made to group or classify all the known named sorts of wheat. Special att tion is called to the elaborate tables which show the characteristics and qualit of the different varieties.

TABLE I.

Number of variety.	Variety.	Time of ripening.	Length of straw. *Inches.*	Quality of straw.	Smooth or bearded.	Size and color of berry.	Hardiness.	Distance of spikelets.	Kernels in spikelet.	General character of head as to color, size and shape.
1	Alabama	June 30	47	Weak	B	M. R.	80	Wide	2–3	White; small, round, and close.
2	American	July 1	47	Medium	B	L. W.	50	Wide	2–3	White; medium, flat, loose.
3	American Clipper	July 3	40	"	B	L. R.	100	Very close.	3–2	White; med., square, compact.
4	Andrews, No. 4	June 30	51	Strong	B	L. R	70	Very close	2–3	Red; med., thick, square set.
5	Armstrong	June 30	51	Medium	S	L. W.	90	Medium	2–3	White; med., rather flat, loose.
6	Arnold's Hybrid	June 30	52	Strong	S	M. W.	70	Wide	2–3	White; small, round, loose.
7	Australian	July 1	50	Weak	B	L. R.	80	Wide	2–3	Red; small, close, round.
8	Bennett	June 30	54	Weak	B	S. R.	100	Wide	2–3	White; small, loose and flat.
9	Big Frame	June 24	43	Strong	S	S. R	80	Medium	3–2	White; med., close, round head.
10	Big May	June 30	49	"	S	M. R.	75	Medium	2–3	White, small, loose and round.
11	Blue Stem	July 4	47	"	S	S. W.	75	Wide	2–3	Red; large, close, round head.
12	Boyer	July 1	52	"	B	L. R.	70	Wide	2–3	Red; medium, loose, round.
13	Brady Lake	June 30	50	"	B	M. R.	100	Very close	2–3	Red; above m., close, sq'r head.
14	Buckeye	June 28	51	"	B	M. R.	85	Wide	3–2	Red; medium, loose, round.
15	California Blue Stem	June 28	49½	Weak	B	L. R.	80	Wide	2	Red; medium, close, round.
16	Canada Club	June 28	49½	"	B	S. R.	95	Close	3–2	Red; medium, square, close.
17	Canadian Express	July 1	47½	Strong	S	L. R.	70	Wide	2	White; medium, round, loose.
18	Champion Amber	June 30	39½	"	S	M. R.	80	Wide	3–2	White; medium, flat, close.
19	Cherry White				S	L. W.				
20	Clawson	June 28	49	Strong	S	L. W.	70	Very wide	3–2	Red; large, flat, close.
21	Cornell, No. 1	June 30	49½	"	S	L. W.	80	Close	2–3	White; medium, close, round.
22	" " 2	June 28	49	"	S	M. W.	75	Wide	3–2	Red; large, flat, loose.
23	" " 3	June 26	48½	"	S	L. W.	80	Medium	3–2	White; medium, loose, round.
24	" " 4	June 28	50½	Weak	B	M. R.	75	Medium	2	Red; small, round and close.

TABLE I.—Continued.

Number of variety.	Variety.	Time of ripening.	Length of straw.	Quality of straw.	Smooth or bearded.	Size and color of berry.	Hardiness.	Distance of spikelets.	Kernels in spikelet.	General character of head as to color, size and shape.
			Inches.							
25	Datt Red	June 27	49	Medium	B	M. R.	90	Wide	2	Red; medium, round, loose.
26	Diehl	June 28	49½	"	S	S. R.	100	Medium	3–2	White; m., close, rather sq'r set.
27	Diehl X Egyptian	June 26	46	Strong	S	M. R.	80	Medium	2–3	White; small, close, round.
28	Democrat	June 28	51	Medium	B	M. R.	90	Wide	2	White; medium, flat, loose.
29	Early May	June 28	54	Weak	S	M. R.	100	Medium	2–3	White; medium, flat, loose.
30	Egyptian	June 28	50	Medium	B	L. R.	95	Medium	3–2	White; m., nearly round, loose.
31	Emporium	June 28	56	Weak	S	L. R.	100	Wide	2–3	White, medium, loose, round.
32	" Scott	July 2	54	Medium	S	L. R.	85	Wide	2–3	White; large, close, flat.
33	Finley	June 25	47½	Strong	S	M. R.	90	Medium	2–3	White; medium, round, close.
34	Fultz	June 25	44	"	S	M. R.	90	Medium	3–4	White; medium, close, round.
35	Fultz X Clawson	July 1	45	"	S	L. R.	60	Very wide	2–3	White; large, round, close.
36	German Amber	June 27	44	Strong	S	M. R.	40	Wide	2–3	Red; above med., round, close.
37	Golden Drop	June 30	50	"	S	M. R.	70	Medium	2	White, small, close, round.
38	Golden Prolific	June 30	48	"	B	S. R.	75	Medium	2–3	White; medium, round, close.
39	Golden Straw	June 25	49½	"	S	M. W.	70	Medium	3–2	White; small, close, round.
40	Gold Medal	July 2	43	"	S	M. W.	30	Close	3–2	White: med., loose, square set.
41	Grecian	July 2	44	"	S	L. W.	60	Medium	2–3	White; large, loose, round.
42	Heckman	July 1	55	Weak	S	M. R.	90	Wide	2	White; small, loose, flat.
43	Heighes' Prolific	June 26	45	Strong	S	M. R.	85	Medium	3–2	White; medium, close, round.
44	Hungarian White Chaff	June 28	46	"	S	M. R.	80	Wide	3	White; large, loose, round.
45	Kentucky White	June 28	47	Medium	S	M. W.	80	Wide	3–2	White; med., rather flat, loose.

46	Lancaster	June 27	48	Medium	B	L. R.	90	Wide	2-3	Red; medium, loose, round.
47	Landreth	July 1	50½	Strong	S	M. W.	70	Wide	3-2	White; large, loose, flat.
48	Lincoln	June 28	44½	“	S	M. W.	70	Very wide	3	Red; large, flat, loose.
49	Mammoth Red	June 30	48½	Strong	S	L. R.	70	Very wide	2-3	Red; large, round, loose.
50	Martin's Amber	July 1	53	“	S	L. W.	80	Wide	2-3	White; medium, loose, flat.
51	McGhee's Red	June 27	47	Medium	S	L. R.	85	Very wide	2-3	Red; med., slightly square set.
52	“ White	June 28	46	Strong	S	M. R.	80	Wide	2-3	Red; small, flatish, open head.
53	Mediterranean	June 27	50	Medium	B	L. R.	80	Wide	2-3	Red; medium, loose, round.
54	Michigan Amber	June 26	47	Strong	S	M. R.	100	Wide	2-3	Red; medium, flat, loose.
55	“ Bronze	June 27	50	“	B	M. R.	95	Very close	2-3	Red; med., thick, square set.
56	Mich Wick	June 28	4	“	B	M. R.	100	Wide	2-3	White; medium, flat, loose.
57	Nigger	June 27	48	Strong	B	L. R,	100	Wide	2-3	White; medium, flat, loose.
58	Ostery	June 26	49	Strong	S	M. W.	100	Medium	3-2	White; small, round, close.
59	Palestine	June 28	51	Weak	S	M. R.	100	Medium	2-3	White; small, round, loose.
60	Pool	June 27	47	Medium	S	M. R.	90	Wide	2-3	Red; medium, loose, flat.
61	Porter	June 24	47	Strong	S	M. W.	90	Wide	2-3	White; small, round, loose.
62	Powers	June 28	47½	“	S	S. W.	90	Medium	2-3	White; medium, loose, round.
63	Red Amber	June 27	47½	Weak	B	L. R.	90	Wide	2-3	Red; small, close, round.
64	“ Chaff	June 27	45	Medium	S	M. R.	90	Wide	3-2	White; large, close, round.
65	“ Fults	June 27	45	Strong	S	M. R.	70	Wide	2-3	Red; medium, loose, rather flat.
66	“ May	June 28	44	“	S	S. R.	85	Wide	3	White; med., rather flat, loose.
67	“ Russian	June 28	47	Medium	B	L. R.	85	Very wide	2-3	Red; medium, loose, round.
68	“ Saa	June 30	49½	Strong	B	L. R.	90	Wide	2-3	Red; medium, close. round.
69	“ Velvet	June 28	50	“	S	S. R.	90	Wide	3-2	Light red; medium, loose, rather square set.
70	Rice	June 28	48	“	S	M. R.	80	Wide	2-3	White; medium, flat, loose.
71	Rickenbrode	July 1	53	Medium	S	L. W.	95	Close	2-3	White; large, close, round.
72	Rocky Mountain	June 26	46	Strong	S	M. R.	90	Wide	2-3	White; medium, close, round.
73	Rogers	July 2	43	“	S	M. R.	75	Wide	3-2	White; medium, flat, loose.
74	Roscoe	June 28	42	“	S	S. W.	75	Close	3-2	Red; small, close, square set.
75	Royal Australian	June 28	47	“	S	....	80	Very wide	3-2	Red; large, flat, very loose.
76	Rural, No. 5	July 3	....	Medium	S	M. R.	70	Very wide	3-2	Similar to Clawson.
77	Russian, No. 2	June 27	47	Strong	S	M. W.	95	Close	3-2	White; small, close, round.
78	Sandomirka	June 28	51	Weak	S	S. W.	95	Wide	2-3	Red; medium, round, close.

TABLE I.—Continued.

No. of variety.	Variety.	Time of ripening.	Length of straw. *Inches.*	Quality of straw.	Smooth or bearded.	Size and color of berry.	Hardiness.	Distance of spikelets.	Kernels in spikelet.	General character of head as to color, size and shape.
79	Scott	July 1	53½	V. weak	S	M. R.	90	Medium	2-3	White; medium, loose, flat.
80	Scott's Bearded	June 28	51	V. weak	B	L. R.	95	Wide	2-3	Red; medium, loose, round.
81	" Smooth	June 30	54½	Weak	S	M. R	100	Wide	2-3	White; medium, loose, flat.
82	Shaffer	June 28	....	Strong	B	M. R.	90	....	....	Similar to Egyptian.
83	Shumaker	June 28	49½	"	S	L. R.	95	Wide	2-3	Red; medium, loose, square.
84	Shumaker X Clawson	June 30	....	Medium	S	M. W.	70	....	....	Similar to Clawson.
85	Siberian	July 2	49	Strong	S	S. R	100	Wide	2-3	Red; medium, round, loose.
86	Sibley's Hybrid	June 28	47½	"	B	L. R.	95	Very close	3-2	Red; medium, close, square set.
87	Silver Chaff	July 1	55	Medium	S	L. W.	95	Medium	2-3	White; large, loose, and flat.
88	Small Frame	June 23	47½	Strong	S	M. R.	100	Medium	3-2	White; small, close, round.
89	Smith's Improved	June 30	51½	"	B	L. W.	100	Medium	2-3	White; medium, flat, loose.
90	Southern Amber	June 24	49	"	S	L. R.	100	Wide	2-3	Red; small, round, loose.
91	Swamp	June 27	53	Medium	B	L. R.	100	Medium	2-3	Red; medium, loose, round.
92	Tappahannock	June 23	44½	Strong	S	L. W.	85	Medium	2-3	White; small, close, round.
93	Tasmanian Red	June 30	49	Medium	B	M. R.	80	Medium	2-3	Red; medium, loose, round.
94	Tennessee Amber	June 30	46	Strong	S	M. R.	60	Medium	3-2	White; above medium, loose, round.
95	Theiss	June 30	48	Weak	B	M. R.	85	Wide	2-3	White; medium, round, loose.
96	Travis	July 2	48	Strong	S	M. R.	80	Wide	2-3	White; medium, flat, loose.
97	" Centennial	....	....	....	S	....	....	....	....	
98	Treadwell (Bearded)	June 30	49	Medium	B	M. W.	80	Medium	2-3	White; medium, flat, loose.
99	" (Smooth)	July 2	49	Strong	S	M. W.	70	Medium	2-3	White; medium, flat, loose.
100	Tuscan Amber	June 28	46	Medium	B	M. R.	80	Wide	2-3	Red; medium, loose, round.

101	Valley	June 28	46	Strong	B	L. R.	90	Wide	3-2	White; medium, flat, loose.
102	Velvet Chaff	June 24	48	“	B	M. R.	90	Wide	2-3	Red; medium, loose, square set; red velvet fuzz covers the chaff.
103	Washington	July 1	50½	Medium	S	L. W.	90	Medium	2-3	White; above medium, loose, round.
104	“ Glass	July 1	52½	“	S	L. W.	85	Close	2-3	White; above medium, loose, round.
105	Wayne Co. Select	June 28	48	“	B	S. R.	85	Close	3-2	White; large, loose, square set.
106	White Blue Stem	June 28	54½	Weak	B	L. R.	90	Wide	3-2	White; medium, flat, loose.
107	“ Eldorado	June 28	52	Medium	S	L. W.	85	Wide	2-3	Red; large, flat, loose.
108	“ Mountain	July 1	53½	Weak	S	L. W.	90	Wide	2-3	White; large, loose, round.
109	“ Rogers	June 28	49½	Strong	B	M. W.	80	Medium	2-3	White; medium, close, round.
110	“ Rose	June 24	50	“	S	M. R.	100	Medium	2-3	White; medium, loose, round.
111	“ Velvet	June 30	51	Medium	S	M. W.	95	Medium	2-3	White; medium, flat, loose.
112	Wild Goose	June 28	48	“	B	S. W.	90	Wide	2-3	White; medium, loose, round.
113	Winter Pearl	June 27	50	Strong	S	M. R.	90	Wide	2-3	Red; medium, round, loose.
114	Wysor's Eureka	June 28	42	“	B	L. R.	90	Wide	3-2	White; medium, flat, loose.
115	Yellow Blue Stem	June 28	51	“	S	L. R.	100	Close	2-3	White; large, loose, round.
116	“ Missouri	July 3	54	Medium	S	S. R.	100	Medium	2-3	White; small, close, round.
117	York White Chaff	June 28	51	Strong	S	S. R.	95	Wide	2-3	White; medium, round, loose.
118	Zimmerman	June 23	46½	“	S	M. R.	100	Close	3-2	White; medium, round, loose.

The above record can scarcely fail to be a valuable means of reference to the progressive wheat grower. A few notes may serve to make the facts set forth more easily understood. Three terms are used to express the character of the straw, viz : *strong*, *medium*, and *weak*; three express the size of kernel, viz.: *large*, *medium*, and *small*; two express the color of kernel, viz : *white* and *red*. In some cases the initial letter only, instead of the whole word, is used.

Hardiness, or ability to withstand the winter, is marked on the scale of 100, the figures indicating the per cent. of a perfect stand in spring, and are the observations of a single season.

The distance between the spikelets or breasts is noted by the words *very wide*, *wide*, *medium*, *close*, *very close*.

The number of kernels in a spikelet is indicated by the use of figures, as follows: "2–3" means generally two kernels per spikelet, but sometimes three "3–2" means generally three kernels, sometimes two. Occasionally four. In describing color of chaff two terms only, "*white*" and "*red*", are used.

In some cases the boundary line between these is obscure, causing some difficulty in correct classification. The words round and square refer to the appearance of the head as regards its circumference. The words "*close*" and "*loose*" specify whether the spikelets are near the stem or stand out from it.

TABLE II.

Number of variety.	Variety.	Number of kernels in one best ear.	Average number in three selected ears.	Average number in ten average ears.	Average number in ten smallest ears.	Number in one smallest ear.	Weight of fifty kernels from three selected ears.	Weight of fifty kernels from ten average ears.	Weight of fifty kernels from ten smallest ears.	Number of kernels in one cubic inch.	Weight of cubic inch.	Average length of three selected ears.	Average length of ten average ears.	Average length of ten smallest ears.
							Gr.	*Gr.*	*Gr.*		*Gr.*	*Inches.*	*Inches.*	*Inches.*
1	Alabama	41	35	23	11	6	30.3	28.2	21.5	369	202.2	4	2 5-8	1 5-8
2	American..........................	56	54	42	14	5	30.8	32.7	25.7	322	196.9	5	4	2
3	American Eclipse..................	....	....	....	....	....	....	....	....	....	....	....	....	....
4	Andrews No. 4.....................	54	47	35	18	11	34.6	36.7	25.9	302	195.8	3 5-8	2 6-8	1 5-8
5	Armstrong	56	45	34	15	13	....	30.0	21.7	326	193.1	4 1-8	3 5-8	1 7-8
6	Arnold's Hybrid...................	54	43	35	16	13	33.3	30.0	24.2	337	198.1	3 6-8	3 2-8	1 6-8
7	Australian......	31	30	22	8	4	24.8	29.6	21.9	351	201.2	3	2 2-8	1 2-8
8	Bennett	55	50	36	11	5	25.8	24.5	20.5	419	207.6	3 4-8	3	1 4-8
9	Big Frame.........................	48	46	36	18	12	19.9	24.6	22.7	488	203.7	3 5-8	2 6-8	1 7-8
10	Big May...........................	35	33	24	19	9	30.6	29.3	23.8	374	202.2	3 6-8	3 7-8	1 3-8
11	Blue Stem.........................	....	....	....	....	....	....	....	....	....	....	....	....	....
12	Boyer	35	32	26	12	7	35.2	32.4	21.6	333	193.5	3 6-8	2 6-8	1 5-8
13	Brady Lake	39	38	37	18	11	34.9	31.9	19.3	347	199.1	3 4-8	2 4-8	1 5-8
14	Buckeye	32	28	24	14	10	31.6	30.6	19.1	356	202.6	3 2-8	2 6-8	1 5-8
15	California Blue Stem..............	31	29	24	14	4	38.3	31.8	28.2	336	204.2	3 3-8	2 5-8	1 4-8
16	Canada Club.......................	65	55	41	22	16	23.6	23.8	15.7	423	196.4	3 5-8	2 5-8	2
17	Canadian Express..................	38	34	27	15	12	37.2	30.7	20.6	293	192.4	4 3-8	3 2-8	1 5-8
18	Champion Amber....................	51	48	38	17	15	33.1	31.3	21.0	316	191.5	4 2-8	3 3-8	1 6-8

TABLE II.—Continued.

Number of variety.	Variety.	Number of kernels in one best ear.	Average number in three selected ears.	Average number in ten average ears.	Average number in ten smallest ears.	Number in one smallest ear.	Weight of fifty kernels from three selected ears.	Weight of fifty kernels from ten average ears.	Weight of fifty kernels from ten smallest ears.	Number of kernels in one cubic inch.	Weight of cubic inch.	Average length of three selected ears.	Average length of ten average ears.	Average length of ten smallest ears.
							Gr.	Gr.	Gr.		Gr.	Inches.	Inches.	Inches.
19	Cherry White													
20	Clawson	49	48	35	16	13	37.2	31.5	22.5	315	198.9	5 1-8	3 4-8	2 1-8
21	Cornell No. 1	45	38	29	16	12	28.8	25.1	20.2	384	211.4	3 2-8	2 4-8	1 5-8
22	" " 2	50	46	39	19	18	36.7	31.2	24.5	300	193.8	5	3 5-8	2 2-8
23	" " 3	59	51	33	18	10	27.6	27.5	20.4	407	201.8	3 1-8	2 5-8	1 7-8
24	" " 4	42	38	24	12	11	36.7	32.4	24.4	307	196.8	3 5-8	2 6-8	1 6-8
25	Datt Red	36	32	25	13	8	30.7	31.9	24.1	341	189.0	3 3-8	2 6-8	1 6-8
26	Diehl	44	39	27	14	13	28.5	24.6	22.2	379	193.5	2 7-8	2 2-8	1 4-8
27	Diehl X Egyptian	43	40	24	14	11	29.6	27.0	25.2	375	204.1	3 3-8	2 4-8	1 2-8
28	Democrat	45	38	25	12	10	31.9	25.0	20.0	370	202.3	3 4-8	3	1 4-8
29	Early May	38	33	27	9	3	23.8	29.8	18.9	405	202.6	3 4-8	2 6-8	1 2-8
30	Egyptian	73	66	38	12	7	31.2	26.9	23.8	377	200.0	4 6-8	3 3-8	1 6-8
31	Emporium	39	37	33	12	16	36.6	24.3	19.7	364	194.8	5	3 5-8	1 6-8
32	Emporium Scott	37	35	25	14	6	37.2	29.1	21.9	312	198.3	3 7-8	2 7-8	1 7-8
33	Finley	35	33	32	16	13	31.3	23.5	20.6	388	204.9	3 5-8	3 1-8	1 7-8
34	Fultz	49	45	35	12	8	26.0	26.2	19.9	311	195.6	3 6-8	3 2-8	1 3-8
35	Fultz X Clawson	34	33	27	16	11	40.5	38.6	28.7	246	193.7	4 5-8	3 2-8	2

36	German Amber	51	45	33	16	14	31.0	30.7	20.9	331	197.0	4 4-8	3 4-8	1 6-8
37	Gold Drop	63	54	26	14	10	26.3	27.1	22.0	380	196.3	4 4-8	2 5-8	1 6-8
38	Golden Prolific	61	54	36	14	5	28.4	26.5	19.9	374	195.5	3 6-8	2 6-8	1 5-8
39	Golden Straw	49	46	26	11	10	27.2	24.1	22.7	367	201.5	3	2 3-8	1 2-8
40	Gold Medal	45	41	31	19	16	26.2	26.2	22.9	379	202.3	3 4-8	2 4-8	1 6-8
41	Grecian	39	38	26	14	12	36.8	33.4	26.9	302	198.7	3 6-8	2 6-8	1 5-8
42	Heckman	34	31	27	13	7	29.5	29.8	23.1	345	203.9	3 5-8	3 1-8	1 4-8
43	Heighe's Prolific	42	39	28	14	10	28.4	27.1	21.8	383	196.4	3 1-8	2 3-8	1 4-8
44	Hungarian White Chaff	50	48	32	15	13	28.1	25.5	22.8	383	200.2	4 1-8	2 6-8	1 5-8
45	Kentucky White	42	36	35	11	15	27.8	26.5	22.7	363	199.4	3 5-8	3	1 2-8
46	Lancaster	42	34	26	12	11	31.2	33.0	25.2	330	197.4	3 6-8	2 7-8	1 6-8
47	Landreth	43	42	30	10	9	34.1	28.1	21.5	352	186.0	4 5-8	3 3-8	1 3-8
48	Lincoln	47	43	40	18	17	36.0	33.5	24.1	300	193.1	4 6-8	4 1-8	2 4-8
49	Mammoth Red	39	38	30	12	6	32.7	31.8	24.9	290	197.5	4 2-8	3 4-8	1 3-8
50	Martin's Amber	43	37	29	8	7	30.9	29.8	22.4	342	197.5	4 7-8	3 2-8	1 4-8
51	McGhee's Red	49	43	34	15	12	30.9	29.6	20.8	372	203.7	4 4-8	3 1-8	1 6-8
52	McGhee's White	32	31	23	11	5	31.2	27.9	25.6	340	197.5	3	2 3-8	1 5-8
53	Mediterranean	32	31	25	10	6	28.5	30.7	22.1	394	200.9	3 6-8	2 6-8	1 5-8
54	Michigan Amber	46	44	35	14	10	30.1	26.1	22.2	344	194.6	3 5-8	3	1 4-8
55	Michigan Bronze	46	40	29	14	8	31.3	28.7	22.4	350	192.9	2 7-8	2 2-8	1 4-8
56	Mich Wick	40	37	30	15	15	33.3	31.6	23.5	332	200.3	3 7-8	3	2
57	Nigger	34	33	22	15	9	38.1	35.8	27.2	322	207.9	3 4-8	2 4-8	1 6-8
58	Ostery	46	43	31	9	7	28.2	30.6	24.0	378	203.5	3 2-8	2 5-8	1 3-8
59	Palestine	35	33	29	17	13	29.3	28.0	20.1	369	196.0	3 6-8	3 2-8	1 5-8
60	Pool	46	45	32	14	9	30.2	27.3	21.8	348	198.9	4 2-8	3 1-8	2
61	Porter	60	56	31	10	8	25.5	30.8	25.4	344	205.1	4 2-8	2 4-8	1 3-8
62	Powers	43	41	33	11	7	26.4	26.8	18.1	377	202.5	2 7-8	2 2-8	1 3-8
63	Red Amber	36	31	26	11	10	32.7	28.4	21.6	340	201.2	3 3-8	3	1 6-8
64	Red Chaff	47	43	29	16	13	25.8	23.8	17.6	384	198.5	3 7-8	2 6-8	1 6-8
65	Red Fultz	44	42	36	13	9	30.9	29.6	23.1	332	197.7	4 2-8	3 2-8	1 6-8
66	Red May	57	55	37	15	10	23.9	25.0	18.4	447	206.5	3 7-8	2 5-8	1 5-8
67	Red Russian	44	43	28	12	7	31.0	34.1	26.4	296	196.8	4	3 1-8	2 1-8

TABLE II.—Continued.

Number of variety.	Variety.	Number of kernels in one best ear.	Average number in three selected ears.	Average number in ten average ears.	Average number in ten smallest ears.	Number in one smallest ear.	Weight of fifty kernels from three selected ears.	Weight of fifty kernels from ten average ears.	Weight of fifty kernels from ten smallest ears.	Number of kernels in one cubic inch.	Weight of cubic inch.	Average length of three selected ears.	Average length of ten average ears.	Average length of ten smallest ears.
							Gr.	Gr.	Gr.		Gr.	Inches.	Inches.	Inches.
68	Red Saa	33	31	26	12	10	35.2	30.6	24.1	325	192.1	3 6-8	3	1 5-8
69	Red Velvet	50	48	34	18	13	26.9	25.8	20.2	379	204.5	3 6-8	3 1-8	1 6-8
70	Rice	38	35	30	16	13	32.6	29.3	22.3	322	202.5	4	3	1 6-8
71	Rickenbrode	51	45	32	9	5	33.5	31.8	24.4	318	192.6	3 7-8	2 7-8	1 2-8
72	Rocky Mountain	55	51	34	14	10	28.2	29.1	18.8	390	197.7	3 5-8	2 7-8	1 6-8
73	Rogers	45	43	31	17	16	33.3	31.4	23.1	323	204.1	4 5-8	3 1-8	2
74	Roscoe	45	44	43	24	18	26.5	23.9	18.1	429	205.7	2 6-8	2 2-8	1 6-8
75	Royal Australian	44	41	38	18	14	35.2	33.5	22.5	310	198.1	4 5-8	4 1-8	2 4-8
76	Rural No. 5	......	......	......	......	......	......	......	......	......	......	......	......	......
77	Russian No. 2	46	42	34	13	8	27.9	27.9	19.0	370	206.2	3	2 4-8	1 6-8
78	Sandomirka	62	55	36	14	10	22.4	22.4	19.3	400	202.5	5 1-8	4	2
79	Scott	33	32	26	10	4	32.9	24.8	18.8	363	196.3	4	3 2-8	1 4-8
80	Scott's Bearded	36	32	27	14	11	31.5	31.8	24.4	322	196.6	3 4-8	3 2-8	1 6-8
81	Scott's Smooth	34	32	25	10	6	33.3	21.3	14.2	362	191.0	4 1-8	3 3-8	1 4-8
82	Shaffer	......	......	......	......	......	......	......	......	......	......	......	......	......
83	Shumaker	36	35	29	14	9	26.5	28.2	21.7	349	198.8	3 7-8	3	1 6-8
84	Shumaker X Clawson	......	......	......	......	......	......	......	......	......	......	......	......	......
85	Siberian	47	45	35	12	4	29.0	25.6	15.7	407	201.5	4 7-8	3 5-8	1 5-8

87	Silver Chaff	50	46	32	10	6	30.9	30.9	23.1	332	195.4	5 1-8	4	1 2-8
88	Small Frame	50	45	33	8	5	25.6	26.7	22.1	429	209 1	3 3-8	2 5-8	1 2-8
89	Smith's Improved	49	44	28	13	6	26.2	29.8	21.5	353	197.5	4	3	1 6-8
90	Southern Amber	45	39	26	9	4	29.3	29.8	25.2	365	214.4	3 2-8	2 4-8	1 2-8
91	Swamp	35	34	24	11	6	30.6	30.9	25.0	335	214.5	3 5-8	3 1-8	1 5-8
92	Tappahannock	46	41	30	15	7	30.1	30.8	21.1	352	208.6	3 4-8	2 5-8	1 6-8
93	Tasmanian Red	50	45	34	11	4	34.7	30.4	20.5	356	191.2	4 4-8	3	1 5-8
94	Tennessee Amber	45	43	34	13	9	27.9	29.9	19.4	352	202.9	4 2-8	2 6-8	1 5-8
95	Theiss	43	43	32	16	12	30.4	26.1	18.7	348	204.0	4	3	2
96	Travis	44	39	28	12	10	32.1	30.1	21.5	362	204.6	4 2-8	3	1 4-8
97	Travis Centennial	....	....	....	....	....	....	....	....	....	....	....	....	....
98	Treadwell, Bearded	57	48	31	13	6	28.2	27.3	24.5	354	205.9	4 1-8	3	1 6-8
99	Treadwell, Smooth	54	48	30	17	13	29.6	30.7	24.8	347	199.7	4 5-8	3 1-8	1 6-8
100	Tuscan Amber	34	30	25	12	18	33.6	31.9	23.8	339	205.4	3 1-8	2 4-8	1 5-8
101	Valley	59	56	41	18	15	27.3	27.5	24.4	384	211.3	3 7-8	3 1-8	2
102	Velvet Chaff	53	48	35	14	10	28.1	26.5	21.8	347	211.4	3 3-8	3	1 6-8
103	Washington	38	36	28	15	12	35.5	32.1	23.0	308	193.7	3 3-8	3	1 6-8
104	Washington Glass	40	38	27	11	5	33.8	31.9	21.5	349	193.5	3 7-8	2 6-8	1 5-8
105	Wayne County Select	69	60	41	18	9	22.1	23.3	16.5	405	188.9	3 4-8	2 5-8	1 6-8
106	White Blue Stem	66	59	42	15	10	24.8	24.7	19.4	397	204.9	4 4-8	3 3-8	2
107	White Eldorado	44	41	35	18	10	33.3	33.0	20.7	312	192.9	4 7-8	3 6-8	2 2-8
108	White Mountain	38	36	29	10	5	33.1	29 8	13.1	351	189.8	4 2-8	3 3-8	1 2-8
109	White Rogers	49	48	34	14	6	26.5	25.3	19.9	401	198.3	3 5-8	2 6-8	1 5-8
110	White Rose	35	33	29	9	5	35.2	36.1	21.1	328	197.1	3 7-8	3 3-8	1 2-8
111	White Velvet	59	52	36	19	11	28.9	27.5	21.8	390	196.8	3 3-8	3	1 5-8
112	Wild Goose	42	33	26	12	5	27.6	24.8	21.3	412	202.2	3 2-8	2 2-8	2
113	Winter Pearl	55	45	36	21	20	30.2	29.8	24.8	337	196.4	4 1-8	3 2-8	2
114	Wysor's Eureka	46	44	31	18	14	34.9	31.9	28.5	300	197.4	3 2-8	2 6-8	2
115	Yellow Blue Stem	36	33	27	12	9	31.5	29.2	21.1	340	194.8	3 2-8	2 7-8	1 4-8
116	Yellow Missouri	45	33	28	7	5	25.3	23.1	16.5	410	192.6	4 2-8	3 1-8	1 2-8
117	York White Chaff	41	38	27	13	3	29.9	27.4	18.5	385	198.6	4 4-6	3 2-8	1 6-8
118	Zimmerman	70	65	36	9	6	33.2	33.3	20.9	426	199.4	3 4-8	2 6-8	1 4-8

Table II is a continuation of table I, and completes the comparison of varieties. A few of those appearing in table I are not found in table II. Those omitted are foreign varieties which matured poorly in this climate, and a few of home grown sorts which were considered unimportant.

Of these 124 varieties, 41 are bearded and 83 smooth.

By a computation made from notes, we find the average hardiness of bearded varieties to be about 65 per cent., and of smooth, to be about 75 per cent. for this year. Our notes of last year represent the hardiness of the bearded varieties by 76 per cent., and smooth by 74 per cent.

No attempt is made to discuss the origin of varieties, for it is a matter about which little can be intelligently asserted.

A prolific source of new varieties is the selection and cultivation of heads which show some variation. Recently, however, great interest has been manifested in the cross fertilization of varieties with the view of combining the good qualities of two varieties, and producing something superior to either parent.

The Station has procured and grown a number of supposed crosses, but in no instance has it been able to see any superiority in the grain produced, and many times it has simply proved to be the variety upon which the cross was made.

It has been held by botanists that cross fertilization rarely takes place in the wheat plant without artificial aid. Observations made at the Station the past season have led us to believe that this is not the case, and that it is quite possible for the pistil of a wheat blossom to receive pollen from the stamens of other flowers on the same head, or a head in close proximity. It is hoped that future observations may aid in settling this question. It is safe to assert that a better understanding of the processes of fertilization in the wheat plant would naturally lead to valuable results in the improvement of this cereal. Eight different crosses were attempted the past year, and perfect grains were secured in all of the heads operated upon. Whether any of these crosses will prove valuable remains to be seen.

IMPROVEMENT BY SELECTION.

During the fall of 1882 eight varieties of wheat were planted for the purpose of improving them by selection. The next season two more were added, making the number now under experiment ten. There was selected for this test an equal number of the best and poorest heads from the product of our small plots.

The results of this work is shown in the following table:

TABLE III.

	1882.	1883.	1884.
	No. Kernels.	*No. Kernels.*	*No. Kernels.*
Clawson, best heads	30	43	39
" poorest heads	16	23	24
Champion Amber, best heads	44	46	54
" " poorest heads	22	14	18
Egyptian, best heads	....	51	57
" poorest heads	....	11	14
Finley, best heads	....	23	44
" poorest heads	....	12	20
Heighes' Prolific, best heads	36	39	39
" " poorest heads	12	18	16
Powers, best heads	54	44	53
" poorest heads	24	19	17
Rice, best heads	38	44	52
" poorest heads	15	16	13
Rickenbrode, best heads	38	43	54
" poorest heads	17	30	26
***Velvet Chaff**, best heads	....	43	49
" poorest heads	....	15	19
Zimmerman, best heads	34	38	51
" poorest heads	17	21	23

*By mistake was not counted in 1882.

The first selections were made from very ordinary samples of wheat. N special culture has been given them. The countings do not represent sin heads, but an average of the best and poorest heads taken from the respecti plots.

The selection was made by measurement and general appearance of the he With the best heads there was an increase in average number of kernels in but two instances, and in most cases this increase is quite marked. T poorest heads show neither regular decrease nor increase of producti ness, the larger heads counted evenly, seldom varying more than five kerne but the smaller heads, though appearing to be even, varied from five to twe kernels.

In growth and general appearance the poor selections were a little infer to best selections, usually being shorter and producing fewer large heads, in most cases bearing some very good heads. Taken as a whole, the sup ority of the better selection was plain and could not be mistaken.

A somewhat curious theory regarding the improvement of wheat origina with Major Hallet, of Brighton, England, and has gone the rounds of agricultural press with more or less comment. The theory, in substance that there is one particular kernel in each head of wheat which is very proli and that the productiveness of this kernel is so great as to exceed by two three times all others in the same head. To test this theory ten varieties wheat were selected from our list, and of these, two heads each were tak and so placed by kernels that the product of each kernel could be rea counted and examined. Of these ten varieties so treated,—twenty he in all—not one stool was found which showed any marked superiority over so other stool of the same head. The kernels were all placed in the order t appeared in the several heads, so that it was an easy matter to tell from w part of the head the kernel came which produced any particular stool. T result, however, was that no perceptible difference could be seen in favor any one stool. All of the varieties produced fine heads, and were caref selected and planted this year.

FIELD TEST OF VARIETIES.

Forty varieties of wheat were tested in plots sufficiently large to admi reliable estimates of yield of grain and straw per acre. The plots were thirty-second of an acre in size. The ground was all prepared in the sa manner, and no pains was spared to properly fit the seed-bed. The land plowed early in September, harrowed immediately, and then rolled. The is a clayey loam, with a gravelly subsoil, affording good natural drainage. odd numbered plots from 1 to 23, inclusive, were sown September 27th. even numbered plots, and all plots above No. 23, were sown September 2

Seed was sown at the rate of five pecks per acre on each plot. The seeding was done with an improved Buckeye drill. The wheat was all cut by hand, and seemed in excellent order. The threshing was done with the Fearless Tread-power thresher. The product of each plot was hauled, weighed, and threshed separately.

The following table gives the result of thee tests, and requires little comments.

The first varieties to ripen were Finley, Russian May, and Golden Straw. These are immediately followed by Michigan Amber, Heighes' Prolific, Rocky Mountain, Velvet Chaff, Fultz, and Egyptian.

The last to ripen were Landreth, Smooth Treadwell, Martin's Amber, Silver Chaff, and York White Chaff.

Tasmanian Red shows the heaviest yield of grain, and is second in weight of straw. Martin's Amber is second in yield of grain, and first in weight of straw.

York White Chaff, Royal Australian, and Rocky Mountain rank third in yield of grain.

Silver Chaff, Rice, Michigan Bronze, White Rogers, McGhee's Red, Red Fultz, Valley, and Bearded Treadwell take fourth rank.

TABLE IV.

No. of plot.	Name of variety.	Bushels per acre.	Weight per bushel.	Size and quality of grain.	Length and quality of straw	Weight of straw.	Date of ripening.	Pounds of straw to 100 cwt. of grain.
1	Velvet Chaff	33.3	62.5	Medium, quite uneven.	Medium height and strength.	4,355	June 28.	218
2	Fultz	36.7	60.5	Medium, uneven, not much shrunken.	Medium height and strength.	4,424	June 28.	201
3	White Velvet	31.6	61.0	Large, quite even, little shrunken.	Tall and weak.	3,955	June 30.	208
4	Red Fultz...	38.2	60.5	Medium, uneven, little shrunken.	Medium and strong.	4,329	June 28.	189
5	Egyptian......................	30.6	61.0	Medium, very uneven, little shrunken.	Medium height and strength.	3,386	June 28.	184
6	Sandomirka....................	28.9	60.5	Small, even.	Medium and strong.	3,312	July 2.	191
7	Finley	30.1	61.0	Small, uneven, little shrunken.	Short and strong.	2,437	June 26.	135
8	Michigan Amber	33.3	60.0	Large, uneven, little shrunken.	Short and strong.	3,397	June 27.	170

9	Lancaster	28.9	61.0	Large, uneven.	Medium and weak.	2,951	June 30.	170
10	McPherson.........................	26.9	60.5	Medium, uneven, little shrunken.	Short and strong.	2,897	June 28.	179
11	Mediterranean	31.0	61.5	Large, uneven, little shrunken.	Medium height and strength.	3,214	June 30.	173
12	McGhee's White	28.8	62.0	Medium, uneven.	Medium and strong.	2,833	June 30.	163
13	Imported Mediterranean..	29.6	....	Medium, even, little shrunken.	Short and weak.	2,031	July 5.	114
14	Theiss	29.4	61.5	Small, very uneven, little shrunken.	Short and strong.	2,902	June 30.	165
15	Smooth Treadwell	35.8	60.0	Large, uneven, little shrunken.	Tall and weak.	3,562	July 3.	166
16	Democrat	35.9	60.5	Medium, even.	Medium and strong.	3,506	June 30.	163
17	Bearded Treadwell	38.0	61.5	Medium, even.	Medium and strong.	4,262	July 1.	187
18	Valley	38.1	61.5	Small, even.	Medium and strong.	3,971	June 30.	174
19	Zimmerman......................	36.0	59.0	Medium, even.	Medium and strong.	4,127	June 30.	191
20	Golden Drop.....	33.6	60.5	Large, uneven.	Medium height and strength.	3,628	June 30.	180

TABLE IV.—Continued.

No. of plot.	Name of variety.	Bushels per acre.	Weight per bushel.	Size and quality of grain.	Length and quality of straw	Weight of straw.	Date of ripening.	Pounds of straw to 100 cwt. of grain.
21	Martin's Amber	45.2	61.5	Large, even.	Tall and medium.	4,873	July 3.	180
22	York White Chaff	42.3	60.5	Medium, uneven, little shrunken.	Tall and strong.	3,612	July 3.	142
23	Champion Amber	36.9	58.0	Medium, uneven, little shrunken.	Short and strong.	3,722	June 30.	168
24	White Rogers	38.5	61.5	Medium, uneven.	Medium and strong.	3,084	July 2.	134
25	Landreth	31.6	60.5	Medium, even.	Tall and medium.	3,627	July 3.	191
26	Heighes' Prolific.............	34.2	60.5	Small, uneven.	Short and strong.	3,155	June 27.	154
27	Michigan Bronze	39.2	61.0	Medium, uneven.	Medium and strong.	4,571	June 30.	194
28	Bennett	29.4	63.0	Small, even.	Medium and strong.	3,427	July 2.	194

29	Nigger	36.6	63.0	Large, even.	Tall and strong.	3,770	June 30.	172
30	Pool	32.6	56.5	Medium, uneven, little shrunken.	Short and strong.	2,728	June 30.	140
31	Rocky Mountain	40.1	62.0	Medium, even.	Medium and strong.	4,157	June 27.	173
32	Wayne Co. Select	26.4	59.0	Small, even.	Medium and strong.	2,820	June 30.	178
33	Russian May	31.9	60.5	Small, even.	Medium and strong.	4,210	June 26.	220
34	Golden Straw	37.1	60.5	Medium, uneven, little shrunken.	Medium and strong.	3,930	June 26.	177
35	Silver Chaff	39.7	60.0	Medium, even.	Medium and strong.	4,305	July 3.	181
36	Rice	39.5	60.5	Large, even.	Medium and strong.	4,790	July 1.	187
37	Clawson	35.8	58.0	Medium, even.	Medium and strong.	4,070	July 1.	189
38	McGhee's Red	38.3	61.0	Large, even.	Medium and strong.	3,870	June 30.	162
39	Tasmanian Red	49.6	62.0	Large, even.	Short and medium.	4,836	June 30.	162
40	Royal Australian	40.2	57.5	Large, even.	Medium and strong.	3,867	July 1.	160

DESCRIPTIVE NOTES ON VARIETIES.

Bennett.—Made a good fall growth, nearly covering the ground. Passed the winter without material injury. Straw tall and of medium strength. Ripened unevenly. Heads rather small. Resembles Egyptian. Bearded. Light colored chaff. Kernels red, small, but even. Yield, 29.4 bushels per acre. Weight of straw, 3,427 pounds per acre. Weight of straw per 100 weight of grain, 144 pounds. Weight of measured bushel, 63 pounds. This is a fine appearing wheat, both in straw and grain.

Champion Amber.—Made a rather weak growth in fall. Stood the winter fairly well, but appeared somewhat weak and uneven in spring. Straw short and strong. Heads medium size. Smooth, white chaff. Kernels medium size, somewhat uneven, and slightly shrunken. Yield, 36.9 bushels per acre. Weight of straw, 3,722 pounds per acre. Weight of straw per 100 weight of grain, 168 pounds. Weight of measured bushel, 58 pounds. A loose, weak appearing wheat.

Clawson.—Moderate growth in fall, and quite uneven. About 40 per cent. winter-killed. Stooled out well, and made a rank growth in early spring. Straw medium length, and unusually strong. Heads large, but not very compact. Chaff reddish cast, smooth. Kernels medium and quite even. Yield 35.8 bushels per acre. Weight of straw, 4,070 pounds per acre. Weight of straw per 100 weight of grain, 189 pounds. Weight of measured bushel, 58 pounds. A well known wheat. Large, characteristic head. Makes fine appearance, and fairly productive.

Democrat.—Grew well in fall, making a very even stand; but slightly injured by the winter. Straw medium height and strong. Heads medium size, and quite compact. Chaff white, bearded. Kernel average size, and very even. Yield, 35.9 bushels per acre. Weight of straw, 3,506 pounds per acre. Weight of straw per 100 weight of grain, 163 pounds. Weight of measured bushel, 61 pounds. A rather fine appearing wheat, quite generally distributed, rather promising.

Egyptian or Gypsy.— Made a rank growth in fall and looked well in spring. Appeared to be but little injured by the winter. Straw of medium height and rather weak. Heads good size. Chaff white and bearded. Kernels very uneven and somewhat shrunken. Yield, 30.6 bushels per acre. Weight of straw, 3,386 pounds per acre. Weight of straw per 100 weight of grain, 184 pounds. Weight of measured bushel, 61 pounds. A well known wheat, and has been quite popular. During past year was badly attacked by the weevil in many parts of the State.

Finley.—Made a strong, healthy fall growth. From ten to fifteen per cent. winter-killed. Grew well in spring, but "thin" at harvest. Straw fine, short and strong. Heads medium size, compact. Chaff white and smooth.

Kernels rather small, uneven, and slightly shrunken. One of the first varieties to ripen. Cut June 26th. Yield, 30.1 bushels per acre. Weight of straw, 2,437 pounds per acre. Weight of straw per 100 weight of grain, 135 pounds. Weight of measured bushel, 61 pounds. Introduced from Canada a few years since by the Department of Agriculture. Now quite well distributed, and in many places reported very promising.

Fultz.—Made a fair growth in fall. Marked "perfect" in spring. Straw of medium height and strength. Heads good size. Ripe June 28th. Kernels medium size, rather uneven, and slightly shrunken. Yield, 36.7 bushels per acre. Weight of straw, 4,424 pounds per acre. Weight of straw per 100 weight of grain, 201 pounds. Weight of measured bushel, 60.5 pounds. Has been a well known and deservedly popular variety, but is thought to be deterioriating in some localities.

Golden Drop.—Made a rather small but healthy fall growth. Only slightly injured by winter. Made very good, even growth in spring. Chaff smooth. Straw about average height and strength. Heads good size. Ripe June 30th. Kernels large and uneven. Yield, 33.6 bushels per acre. Weight of straw, 3,628 pounds per acre- Weight of straw per 100 weight of grain, 178 pounds. Weight of measured bushel, 60.5 pounds. Very similar to Finley.

Golden Straw.—Growth in fall rather slight. Injured but little by winter. made excellent growth in spring. Heads medium size. Chaff white and smooth. Straw of medium length, strong. One of the earliest to ripen. Cut June 26th. Kernels fair size, somewhat uneven, and a little shrunken. Yield per acre, 37.1 bushels. Weight of straw, 3,930 pounds per acre. Weight of straw per 100 weight of grain, 177 pounds. Weight of measured bushel, 60.5 pounds. Very similar to above.

Heighe's Prolific.—Made fair fall growth. About 20 per cent. winter killed. Stand not very good in spring, but grew well. Marked "thin" at harvest; a fine looking plot. Straw short and strong. Ripe June 27th. Heads small. Kernels small and uneven. Yield, 34.2 bushels per acre. Weight of straw, 3,155 pounds per acre. Weight of straw per 100 weight of grain, 154 pounds. Weight of measured bushel, 60.5 pounds. Similar to Finley.

Lancaster.—Made a rank growth in fall. Ten per cent. winter-killed. Grew finely in spring and made a good stand. Straw weak but not lodged. Heads small. Ripe June 30th. Yield, 28.9 bushels per acre. Weight of straw, 2951, pounds per acre. Weight straw per 100 weight of grain, 170 pounds. Weight of measured bushel, 61 pounds. This is an old variety. Doubtless identical with Mediterranean.

Landreth.—Made a good fall growth. Not much injured by the winter Grew thriftily in spring. Straw quite tall and strong. Heads large. Rip late. Cut July 3d. Kernels medium size and even. Resem

Amber. Yield, 31.6 bushels per acre. Weight of straw, 3,627 pounds per acre. Weight of straw per 100 weight of grain, 191 pounds. Weight of measured bushel, 60.5 pounds. A new variety, originated in Pennsylvania, and introduced by David Landreth & Son. A good white wheat.

McGhee's Red.—Good growth in fall. About fifteen per cent. winter killed. Straw medium length, strong. Heads good size. Ripe June 30th. Kernels large and even. Yield, 38.3 bushels per acre. Weight of straw per acre, 3,870 pounds. Weight of straw per 100 weight of grain, 168 pounds. Weight of measured bushel, 61 pounds.

McGhee's White.—Grew finely in fall, and but slightly injured by the winter. Straw medium length, strong. Heads good size, a few imperfect. Ripe June 30th. Kernels medium size, slightly uneven. Yield per acre, 28.8 bushels. Weight of straw, 2,833 pounds per acre. Weight of straw per 100 weight of grain, 164 pounds. Weight of measured bushel, 62 pounds. Distributed by Department of Agriculture in 1883. Quite similar to Finley.

McPherson.—Made a good stand in the fall, and but slightly winter killed. Straw short and strong. Heads good size, beardless, about one half velvety and one-half smooth. Ripe June 28th. Kernels medium size, uneven, and somewhat shrunken. Yield, 26.9 bushels per acre. Weight of straw, 2,897 pounds. Weight of straw per 100 weight of grain, 179 pounds. Weight of measured bushel, 60.5 pounds. This wheat was received from Mr. J. H. McPherson, Xenia, Ohio; apparently is not a pure variety.

Mediterranean.—Growth in fall rather small. About twenty per cent. winter-killed. Straw medium length, and much stronger than usual. Heads fair size. Ripe June 30th. Kernels good size, somewhat variable and slightly shrunken. Yield, 31 bushels per acre. Weight of straw, 3,214 pounds per aere. Weight of straw per 100 weight of grain, 173 pounds. Weight of measured bushel, 61.5 pounds. One of the best known; an old and standard varieties. Not so prolific as some others, but generally sure. Straw nearly always weak.

Michigan Amber.—Only a moderate fall growth. Not much injured by the winter. Small, and in places thin on the ground in spring, presenting an uneven appearance. Straw short and strong. Heads medium size, rather loose. Ripe June 27th. Kernels large, uneven, and a little shrunken. Yield, 33.3 bushels per acre. Weight of straw, 3,397 pounds per acre. Weight of straw per 100 weight of grain, 170 pounds. Weight of measured bushel, 60 pounds. A variety distributed by the Department of Agriculture in 1883.

Martin's Amber—Made a rank fall growth, and was but little injured by the winter. Straw tall and of medium strength. Heads nearly white in color, long and compact. One of the latest varieties to ripen. Cut July 3d. Kernels large, white and even. Yield per acre, 45.2 bushels. Weight of straw, 4,873 pounds per acre. Weight of straw per 100 weight of grain, 180 pounds. Weight of measured bushel, 61.5 pounds. A good variety of white wheat, introduced by J. A. Everitt, fall of 1882.

Nigger.—Made a fair growth in the fall, and stood the winter without appreciable injury. Straw tall and strong. Heads fair size. Ripe June 30th. Kernels large, red, hard and very even. Yield 36·6 bushels per acre. Weight of straw, 3,770 pounds per acre. Weight of straw per 100 weight or grain, 171 pounds. Weight of measured bushel, 63 pounds. A fine appearing wheat; has been much grown in southeastern part of State, but not well distributed until recently. Quite promising.

Pool—Fall growth rather small. Plants of a poor color, slightly winter-killed. Straw short, but strong. Heads medium size. Somewhat affected with smut. Ripe June 30th. Kernels medium size, uneven and slightly shrunken. Yield, 32.6 bushels per acre. Weight of straw, 2,728 pounds per acre. weight of straw per 100 weight of grain, 140 pounds. Weight of measured bushel, 56.5 pounds.

Rice.—Made a good fall growth. From 12 to 15 per cent. winter killed. Straw medium length, strong. Heads fair size, and quite compact. Ripe July 1st. Kernels large and even. Yield, 39.5 bushels per acre. Weight of straw, 4,790 pounds per acre. Weight of straw per 100 weight of grain, 202 pounds. Weight of measured bushel, 60.5 pounds. Resembles Finley, with heavier straw.

Rocky Mountain.—Grew rank in fall, and covered the ground. About 15 per cent. winter-killed. Straw medium length, strong. Heads medium size, and compact. Ripe June 27th. Kernels medium size, and even. Yield, 40.1 bushels per acre. Weight of straw, 4,157 pounds per acre. Weight of straw per 100 weight of grain, 173 pounds. Weight of measured bushel, 62 pounds. Resembles Finley in general appearance.

Royal Australian.—Germinated well and made a good growth in fall, but slightly injured by the winter. Straw of medium length, strong. Heads very fine. Ripe July 1st. Kernels good size, very even. Did not appear shrunken, yet one of the lightest wheats grown. Yield per acre, 40.2 bushels. Weight of straw per acre, 3,867 pounds. Weight of straw per 100 weight of grain, 160 pounds. Weight of measured bushel, 57.5 pounds. A new wheat, introduced by Mr. A. D. Betz, Norton Center, Ohio. Resembles Clawson in appearance of head.

Russian May.—Grew rank and thick in fall, but had a yellowish color. Ten per cent. winter-killed. Straw moderately strong and of medium height. Heads fair size. Ripe June 26th. One of the earliest varieties. Kernels small, even. Yield, 31.9 bushels per acre. Weight of straw, 4,210 pounds.

Weight of straw per 100 weight of grain, 220 pounds. Weight of measured bushel, 60.5 pounds. Resembles Finley.

Sandomirka.—Germinated well, but did not make a strong fall growth. But little injured by the winter. Straw moderately tall and strong. Heads not large but compact. Ripe July 2d. Kernels small and even. Yield, 28.9 bushels per acre. Weight of straw, 3,312 pounds per acre. Weight of straw per 100 weight of grain, 191 pounds. Weight of measured bushel, 60.5 pounds.

Silver Chaff.—Appeared thin on ground in fall, but of good color. About 15 per cent. winter killed. Straw large and of medium strength. Ripe July 3d. Heads large and smooth. Kernels medium size, quite even and not shrunken. Yield, 39.7 bushels per acre. Weight of straw, 4,305 pounds per acre. Weight of straw per 100 weight of grain, 181 pounds. Weight of measured bushel, 60 pounds.

Tasmanian Red.—Made a good growth in fall. Passed the winter without injury. Looked healthy and strong in early spring. Straw medium height, and only moderately strong. Head good size. Ripe June 30th. Kernels large and even. A red, bearded wheat, resembling Mediterranean and Lancaster. Yield, 49.6 bushels per acre. Weight of straw, 4,836 pounds per acre. Weight of straw per 100 weight of grain, 162 pounds. Weight of measured bushel, 62 pounds. This wheat has been growh in this country for some years, but has not been widely distributed. Mr. N. H. Tillman, of Arcanum, Ohio, furnished the Station with seed last year, from which the crop was grown. It is a variety of much promise.

Valley.—Grew well in fall, and passed the winter without material injury. Straw medium height and strong. Heads good size, rather loose. Ripe June 30th. Kernels small but plump and even. Yield, 38.1 bushels per acre. Weight of straw, 3,971 pounds. Weight of straw per hundred weight of grain, 174 pounds. Weight of measured bushel, 61.5 pounds. This is a fine appearing wheat, somewhat resembles Egyptian, but is more productive. Mr. Elias Teeter, Pleasant Plain, Ohio, furnished seed for last year's crop.

Velvet Chaff.—Made an extra good growth in fall. But slightly injured by the winter. Straw medium height and quite strong. Heads fair size. Ripe June 28th. Kernels medium size, quite uneven. Yield, 33.3 bushels per acre. Weight of straw, 4,355 pounds per acre. Weight of straw per hundred weight of grain, 229 pounds. Weight of measured bushel, 62.5 pounds. This variety has become quite well distributed within the last few years, and is quite popular. It is quite liable to rust; and to shrink in hot, damp harvest. At present it is our standard red wheat at the Station, and is used in all the general work.

White Rogers.—Made a small growth, and appeared thin on the ground. Not much injured by the winter. Straw average height and strength. Head good. Ripe July 2d. Kernels medium size and uneven. Yield, 38.5 bushels per acre. Weight of straw, 3,084 pounds per acre. Weight of straw per hundred weight of grain, 134 pounds. Weight of measured bushel, 61.5 pounds. Had a poor appearance through the season, but gave good yield at harvest.

York White Chaff.—Good growth in fall, and but slightly winter-killed. Straw tall and strong. Head large. Ripe July 3d. Kernels medium size, somewhat uneven, and slightly shrunken. Yield, 42.3 bushels per acre. Weight of straw, 3,612 pounds per acre. Weight of straw per hundred weight of grain, 142 pounds. Weight of measured bushel, 60.5 pounds.

Zimmerman.—Germinated well and made a fair fall growth. About ten per cent. winter-killed. Straw medium height, strong. Heads fair size. Ripe June 30th. Kernels medium size and even. Yield, 36 bushels per acre. Weight of straw, 4,127 pounds per acre. Weight of straw per hundred weight of grain, 191 pounds. Weight per measured bushel, 59 pounds.

Theiss.—Made small growth and looked thin on the ground. Ten per cent. winter killed. Straw short and moderately strong. Heads small. Ripe June 30th. Kernels small, very uneven, and considerably shrunken. Yield, 29.4 bushels per acre. Weight of straw, 2,902 pounds per acre. Weight of straw per hundred weight of grain, 165 pounds. Weight of measured bushel, 61.5 pounds. The straw of this wheat is usually weak. This season it was short and thin on the ground, standing up quite well. The Theiss was imported from Hungary, some years since, and is there regarded one of their best milling wheats.

THICK AND THIN SEEDING.

This work was a repetition of last year's tests, with some changes in location of plots.

This year the plots occupied a continuous section of the experiment field, which was very uniform, as regards character and condition of soil. The plots were one-sixteenth of an acre each. They received similar treatment, except in amount of seed used. This varied from three to nine pecks per acre, the amount being increased at the rate of one peck per acre for each plot.

The variety of wheat sown was Velvet Chaff. Date of sowing, September 22. Date of harvesting, June 26 and 27. There was a slight difference in the time of ripening, the earliness being in favor of the thick seeding. Plots 6 and 7 were ripe June 26, the others one day later.

It will be seen from the table, that the highest yield of grain comes from five pecks of seed.

When three pecks are used the yield is but 6.3 bushels less than the best, and is better than that given by four pecks. The weight of straw per hundred pounds of grain increases quite regularly with the quantity of seed used per acre. The straw of the thickly seeded plots was more slender and did not stand up quite so well as the straw on those plots where less seed was used.

The weight of grain per measured bushel shows an almost uniform increase from the thin to the thicker seeding.

This is accounted for by the size of the kernel, which, as a rule, decreases with the amount of seed sown.

The following table gives the result of the test:

TABLE V.

Number of plot.	Amount of seed per acre—pecks.	Yield of grain per acre—bushels.	Yield of straw per acre—pounds.	Weight of measured bushel—pounds.	Pounds of straw to 100 pounds of grain.
One	3	35.6	3,631	61.0	170
Two	4	33.7	3,607	62.0	178
Three	5	41.9	4,400	62.5	175
Four	6	37.6	4,552	62.0	201
Five	7	39.8	4,563	63.5	191
Six	8	38.0	4,832	63.5	212
Seven	9	37.0	4,765	64.0	215

There were nearly three million acres of wheat sown in Ohio the past season.

The saving of one peck of seed per acre on this vast area would amount to 700,000 bushels. Would anything be lost in yield if this saving was effected?

All of the tests made at the Station go to prove that most farmers of Ohio sow wheat too thickly for any but very poor land. It is a safe proposition that the richer the soil, and more perfect the seed bed, the less the amount of seed required. No dogmatic rule can be given as to just the proper amount of seed to sow.

The condition of the soil, as to fertility and preparation, the exposure of the field, the character of the seed as to size of kernels and vitality, the capacity of certain varieties for tillering, the liability of injury from insects and other enemies, are all factors that should be duly considered in determining the amount of seed to use. The better the conditions, the less the amount of seed required.

WINTER PROTECTION AND SPECIAL TREATMENT IN SPRING.

Under this heading is reported the results of some tests in mulching with straw, the application of fertilizers, and spring cultivation. The tests were confined to a series of eight plots, of one thirty-second of an acre each.

The plots were all prepared in the same manner, sown at the same date, and treated alike in every respect, excepting the method reported in the table. The winter of 1882 83 was very severe on the wheat plant. In December one plot was covered with a light coating of straw. This seemed to protect the plants from further injury, and the experiment resulted so favorably it was thought best to test the matter more thoroughly the next season.

Accordingly three plots were set apart to be treated with straw mulch. One plot was covered very slightly; another was covered about twice as heavy, and upon the third three times as much was used as on the first. As will be seen by the table, the mulch, except in the first instance, proved an injury to the crop. The winter of 1883-84 was quite different from that of the preced-year. Instead of the ground being bare most of the time, and the temperature extremely variable, there was an unusual amount of snow, and the weather was quite uniformly cold.

Under these conditions the straw mulch, except where sparingly used, proved an injury instead of a benefit.

The yield of plot No. 2 was evidently increased, but where the straw was used more plentifully, as in the case of plots 3 and 4, it proved a decided injury.

The mulch and snow together evidently smothered the plants, and checked the growth in spring. The stand was poor throughout the season, and the wheat ripened six days later than that of plots 1 and 2.

Plot No. 4 which was heavily mulched was a total failure.

To plots 5, 6 and 7 fertilizers were applied in spring.

These different soluble fertilizing materials had a marked effect upon the growth and color of the wheat.

The yield of grain and straw is shown in the table.

Plot 8 was thoroughly hoed between the drill rows twice during the spring. It shows a marked increase in yield over plot 1, but considerably less than plots 6 and 7. The ratio of straw to grain is unusually large.

TABLE VI.

No. of plot.	Treatment.	Yield of grain per acre—bushels.	Weight per measured bushel—pounds.	Yield of straw per acre—pounds.	Weight of straw per 100 lbs. of grain.
1	Ordinary	37.9	63.0	4,183	184
2	Light covering of straw in fall	45.5	63 0	4,580	169
3	Medium covering of straw in fall	32.9	61.0	3,530	179
4	Heavy covering of straw in fall	Failure.			
5	Dried blood, 600 pounds per acre; applied April 14, 1884	46.7	63.5	4,532	162
6	Sulphate of ammonia, 300 pounds per acre; applied April 14, 1884	53.0	....	6,031	190
7	Special wheat manure, 600 pounds per acre; applied April 14, 1884	52.6	62.5	5,811	184
8	Hoed twice between drill rows in the spring	46.7	62.0	5,851	209

EARLY AND LATE SEEDING.

The Station repeated the test "of early and late seeding," the number of plots being increased to 10, and the time of seeding extended until October 27.

The plots devoted to this test occupied a continuous portion of the experiment field, and the soil appeared to present little variation as regards its character.

The preparatory tillage of each plot was done the same date as the seeding. The ground was plowed, then rolled and harrowed, then rolled again. The seeding was done with a Buckeye grain drill, and applied at the rate of five pecks per acre for each plot. No fertilizers were used. The plots contained exactly one sixteenth of an acre each. The variety of wheat sown was Velvet Chaff, care being taken to use the same sample on all the plots. The wheat was harvested, threshed, and weighed in the same manner as described under "test of varieties."

The following table exhibits the result of the test:

TABLE VII.

No. of plot.	When sown.	Yield of grain per acre—bushels.	Weight per measured bushel—pounds.	Yield of straw per acre—pounds.	Weight of straw per 100 lbs. of grain—pounds.	Time of ripening.	Yield of grain for 1883—bushels.
1	August 25th…………	35.8	63.0	4,713	219	July 2d.	24.1
2	September 1st………	51.8	63.5	5,745	185	July 2d.	40.0
3	September 8th………	55.6	64.5	5,637	169	July 2d.	34.9
4	September 15th………	57.2	64.0	6,040	176	July 2d.	42.4
5	September 22d ………	53.2	64.0	4,977	156	July 2d.	31.7
6	September 29th………	54.6	63.0	5,171	158	July 2d.	47.1
7	October 6th …………	56.9	63.5	4,565	134	July 2d.	34.7
8	October 13th …………	44.4	62.5	4,169	157	July 2d.	30.0
9	October 20th …………	43.6	62.5	3,936	150	July 3d.	…………
10	October 27th …………	35.6	63.5	3,448	161	July 3d.	…………

Owing to the lack of moisture plot No. 1 germinated very unevenly, as did plot No. 2. September 10, a little more than two weeks after the date of the first sowing, only a few scattering plants were to be seen. From August 22 until September 18, there were but three showers, and the total rain fall for this period was less than one and one-half inches. After September 18 showers were frequent, and there were several heavy rainfalls during the latter part of October. It will be seen from the table that plot No. 1, sown August 25, yielded much less than those sown later, excepting plot 10, which was sown October 27, and which yielded about the same. Plots 2, 3, 4, 5, 6 and 7, sown September 1, 8, 15, 22, 29, and October 6, respectively, showed but a slight variation in yield. The plots sown after October 6 show a marked decrease. The wheat in plot 10, sown October 26, had scarcely germinated when cold weather set in and checked the growth. In early spring it was marked 95 per cent missing, and no one who saw the plot thought it would return more than the seed sown. It was a good illustration of the wonderful vitality and recuperative power of the wheat plant.

The plot sown October 20 looked nearly as bad in spring and was marked 10 per cent. of a perfect stand. It yielded 43.6 bushels. Plot No. 8, sown October 13, appeared very much better in spring. It was marked 20 per cent. of a good stand. It yielded less than one bushel more than plot 9. Compared with the wide range of time in sowing, the variation in the time of r ing was slight. The difference appeared to be due to the number or thicl of the plants on the ground, rather than to any difference in time of sov The weight of measured bushel of grain shows some variation, but i marked. The heaviest are from plots which show the largest y It will be noticed that there is a greater variation in the weight of straw in the yield of grain.

Repeated examinations of Plot No. 1, sowed August 25, showed that of the Hessian fly were deposited soon after the wheat came up. By Sep ber 25 the ravages by this insect were plainly visible. Careful esti made at this time showed about one eighth of the plants affected. A later it was estimated that about 10 per cent. of the wheat was destroye this pest.

Plot No. 2 was similarly affected, although the injury appeared t slightly less.

Some larvæ were found in Plot No. 3, but the injury here was slight.

No perceptible injury was done to Plot 4, sown September 15, althou few larvæ were found. The fly was not found in any of the plots sown this date. Our observations and investigations the past season lead to the general conclusions arrived at last year, viz. :

1. Winter wheat may be sowed too early in the season, or it may be s too late; so there must be a certain time, neither too early nor too late, v is the best date to put in the seed.

2. Many factors must be considered in designating the best time to The condition of the soil and the exposure, the presence of the Hessia etc., must all be duly considered.

3. Early seeding does not secure an early harvest. The same variety under the same conditions will mature about the same time, whether the ing be done the first of September or the first of October.

4 Wheat sown as late in the season as it can be, and still be given ti become firmly and strongly rooted and time to develop leaves sufficie cover the whole ground, will best endure the winter.

5. The earliest sown wheat usually has the largest top and proportio the smallest root; in the latest sown wheat the root is proportionally la This may be reversed by peculiarities of soil and season.

6. On poor soil and badly prepared ground wheat should be sown e than upon rich soil and a well prepared seed-bed.

7. In this latitude the Hessian fly is not very troublesome in wheat later than September 25.

8, The best date for sowing winter wheat in central Ohio is from Sep ber 10 to September 30, according to the conditions mentioned above.

APPLICATION OF FERTILIZERS.

This work comprises a large number of tests of various fertilizing agents, and occupied a considerable area of the experiment grounds.

The following diagrams will show the arrangement of the plots in 1882 83, and the changes and additions made in 1883-84.

DIAGRAM SHOWING PLOTS OF FIRST SERIES AS FERTILIZED IN 1882–83.

24		18. Common drill, 6 pecks per acre.
23		17. Ridge culture, 6 pecks per acre.
22		16. Ridge culture, 4 pecks per acre.
21		15. Ridge culture, 2 pecks per acre.
20		14. Salt, 5 bushels per acre.
19		13. Plaster, 600 pounds per acre.
		12. Unfertilized.
		11. Special wheat manure, 800 pounds per acre.
North.	Center road.	10. Mixture { Nitrate of soda, 150 pounds per acre. Muriate of potash, 75 " " Rock phosphate, 200 " "
		9. Unfertilized.
		8. Mixture { Muriate of potash, 150 pounds per acre. Rock phosphate, 400 " "
		7. Mixture { Nitrate of soda, 300 pounds per acre. Rock phosphate, 400 " "
		6. Muriate of potash, 150 pounds per acre.
		5. Nitrate of soda, 300 pounds per acre.
		4. Special wheat manure, 600 pounds per acre.
		3. Special wheat manure, 500 pounds per acre.
		2. Unfertilized.
		1. Special wheat manure, 200 pounds per acre.

RAM SHOWING PLOTS OF FIRST SERIES AS FERTILIZED IN 1883–84.

North. Center road. Aisle two feet wide cut crosswise through center of plots.

	18 A.	Dry excrement, 16 tons per acre.	18 B.	Unfertilized.
23	17 A.	Urine, 16 tons per acre.	17 B.	Hen manure, 5 ton per acre.
22	16 A.	Fresh cow manure, 16 tons per acre.	16 B.	Unfertilized.
21	15 A.	Fresh horse manure, 16 tons per acre.	15 B.	Cow manure, 2/3, Horse manure, 1/3, } mixed, 16 tons per acre.
20	14 A.	Cow manure, 16 tons per acre, composted.	14 B.	Cow manure, 1/3, Horse manure, 2/3, } mixed, 16 tons per acre.
19	13 A.	Horse manure, 16 tons per acre, composted.	13 B.	Cow manure, 1/2, Horse manure, 1/2, } mixed, 16 tons per acre.
	12 A.	Unfertilized.	12 B.	Unfertilized.
	11 A.	Dried blood, 300 pounds per acre.	11 B.	Dried blood, 600 pounds per acre.
	10 A.	Muriate of potash, 75 pounds per acre. Nitrate of soda, 150 " Rock phosphate, 200 "	10 B.	Muriate of potash, 75 pounds per acre. Sulphate of amonia, 150 " Rock phosphate, 200 "
	9 A.	Unfertilized.	9 B.	Unfertilized.

North.	Center road.	7 A.	Rock phosphate, 400 pounds per acre.	2 feet wide.	7 B.	Sulphate of amonia, 150 pounds per acre. Rock phosphate, 200 "
		6 A.	Muriate of potash, 150 pounds per acre.		6 B.	Sulphate of amonia, 150 pounds per acre. Muriate of potash, 75 "
		5 A.	Nitrate of soda, 300 pounds per acre.		5 B.	Muriate of potash, 75 pounds per acre. Nitrate of soda, 150 "
		4 A.	Left as treated previous year.		4 B.	Special wheat manure 600, pounds per acre.
		3 A.	Left as treated previous year.		3 B.	Special wheat manure, 400 pounds per acre.
		2 A.	Left as treated previous year.		2 B.	Unfertilized.
		1 A.	Left as treated previous year.		1 B.	Special wheat manure, 200 pounds per acre.

DIAGRAM SHOWING PLOTS OF SECOND SERIES AS FERTILIZED IN 1882-83,

North.	Stable manure, 16 tons per acre.	24	Center road.	18
	Stable manure, 13 tons per acre.	23		17
	Mixture—Nitrate of soda, 300 pounds, Rock phosphate, 400 pounds, muriate of potash, 150 pounds per acre.	22		16
	Mixture—Nitrate of soda, 300 pounds, muriate of potash, 150 pounds per acre.	21		15
	Unfertilized.	20		14
	Rock phosphate, 400 pounds per acre.	19		13

DIAGRAM SHOWING PLOTS OF SECOND SERIES AS FERTILIZED IN 1883-84.

North.						Center road.
	Left as fertilized last year.				24	
	Wood ashes, 75 bushels per acre.	23 B	Aisle 2 feet wide.	Left as fertilized last year.	23 A	
	Lime, 50 bushels per acre.	22 B		Left as fertilized last year.	22 A	
	Plaster, 500 pounds per acre.	21 B		Left as fertilized last year.	21 A	
	Unfertilized.	20 B		Unfertilized.	20 A	
	Salt, 5 bushels per acre.	19 B		Left as fertilized last year.	19 A	

The diagram showing the arrangement of the plots for 1883-84 differs fro that showing the arrangement for 1882-83, in having each plot divided in two equal parts by a central walk two feet in width. The object of this w to increase the number of plots, and still continue the application of certa fertilizers on the same ground for a succession of years.

Table VIII exhibits the method of treatment, and shows the yield of gra per acre for the two years.

TABLE VIII.

No. of plot.	Whole plots as treated in 1882-83.	Yield of grain per acre, 1883—bushels.	No. of plot.	First section of same plot as treated in 1883-84.	Yield of grain per acre in 1884—bushels.	No. of plot.	Second section of same plot as treated in 1883-84.	Yield of grain per acre in 1884—bushels.
1	Special wheat manure, 200 lbs. per acre...........................	33.3	1A	Left as treated previous year...	44.4	1B	Sp'l wheat manure, 200 lbs. p. A	48.4
2	Unfertilized..............................	29.0	2A	Left as treated previous year...	46.6	2B	Unfertilized	45.2
3	Special wheat manure, 500 lbs. per acre...........................	43.7	3A	Left as treated previous year...	48.8	3B	Sp'l wheat manure, 400 lbs. p. A	42.0
4	Special wheat manure, 600 lbs. per acre...........................	43.9	4A	Left as treated previous year...	49.4	4B	Sp'l wheat manure, 600 lbs. p. A	43.4
5	Nitrate of soda, 300 lbs. per A..	25.5	5A	Nitrate of soda, 300 lbs. per A...	47.8	5B	Mur. of potash, 75 lbs. per A Nitrate of soda, 150 "	44.2
6	Muriate of potash, 150 lbs. p. A	31.1	6A	Muriate of potash, 150 lbs. per A	40.8	6B	Sulph. of am'nia, 150 lbs. p. A Mur. of potash, 75 "	45.2
7	Nitrate of soda, 300 lbs. per A Rock phosphate, 400 "	31.6	7A	Rock phosphate, 400 lbs. per A.	39.3	7B	Sulph. of am'nia, 150 lbs. p. A Rock phosphate, 200 "	47.1
8	Mur. of potash, 150 lbs. p. A. Rock phosphate, 400 "	32.9	8A	Sulphate of am'nia, 150 lbs. p. A	47.4	8B	Mur. of potash, 75 lbs. per A Rock phosph., 200 "	40.3

TABLE VIII.—Continued.

No. of plot.	Whole plots as treated in 1882-83.	Yield of grain per acre in 1883—bushels.	No. of plot.	First section of same plot as treated in 1883-84.	Yield of grain per acre in 1884—bushels.	No. of plot.	Second section of same plot as treated in 1883-84.	Yield of grain per acre in 1884—bushels.
9	Unfertilized	30.8	9A	Unfertilized	42.8	9B	Unfertilized	44.6
10	Nitrate of soda, 150 lbs. per A Mur. of potash, 75 " Rock phosph., 200 "	30.1	10A	Mur. of potash, 75 lbs. per A Nitrate of soda, 150 " Rock phosph., 200 "	46.0	10B	Muriate of potash, 75 lbs. p. A Sulph. of am'nia, 150 " Rock phosphate, 200 "	43.8
11	Special wheat manure, 800 lbs. per A	46.4	11A	Dried blood, 300 lbs. per A	52.4	11B	Dried blood, 600 lbs. per A.....	47.8
12	Unfertilized	30.0	12A	Unfertilized	47.4	12B	Unfertilized	41.6
13	Plaster, 600 lbs. per A............	29.3	13A	Horse manure (composted) 16 tons per A........................	55.4	13B	Cow manure, ½ Horse " ½ } composted, 16 tons per A..	49.7
14	Salt, 5 bushel per A...............	39.5	14A	Cow manure (composted) 16 tons per A........................	57.0	14B	Cow manure, ⅓ Horse " ⅔ } composted, 16 tons per A..	48.4
15	Used in methods of culture during 1882-83 and received no fertilizer	....	15A	Fresh horse manure, 16 tons per A	60.2	15B	Cow manure, ⅔ Horse " ⅓ } 16 tons per A	51.5
16	Same	....	16A	Fresh cow manure, 16 tons p. A	55.6	16B	Unfertilized	46.0

17	Same	....	17A	Cow urine with chaff, 16 tons per A	59.7	17B	*Hen manure, 5 tons per A.....	....
18	Same	....	18A	Dry excrement, 16 tons per A	56.8	18B	Unfertilized	41.5
19	Rock phosphate, 400 lbs. per A.	32.2	19A	Left as treated previous year...	40.7	19B	Salt, 5 bu. per A	43.5
20	Unfertilized	36.3	20A	Left as treated previous year...	35.8	20B	Unfertilized	41.4
21	Nitrate of soda, 300 lbs. p. A Mur. of potash, 150 "	36.5	21A	Left as treated previous year...	41.8	21B	Plaster, 500 lbs. per A............	41.5
22	Nitrate of soda, 300 lbs. p. A Rock phosph., 400 " Mur. of potash, 150 "	34.8	22A	Left as treated previous year...	38.5	22B	Lime, 50 bu. per A.................	40.0
23	Stable manure, 13 tons per A..	30.1	23A	Left as treated previous year...	48.1	23B	Wood ashes, 75 bu. per A	45.1
24	Stable manure, 16 tons per A..	39.6	24	Left as treated previous year.				54.3

* This plot, on account of an error in handling, is left out of the report.

The average yield of the unfertilized plots for 1883 is 31.5 bushels per ac and the average of the fertilized plots is 35 bushels per acre, or an increase 3.5 bushels.

The same comparison for the year 1884 gives the following averag Unfertilized plots, 43.2 bushels per acre; fertilized plots, 46.2 bushels acre; an increase of 3 bushels.

In the above estimates plots 15, 16, 17, and 18 are omitted.

An examination of Table VIII reveals a poor showing for the commerc fertilizers tested, and the results sanction the almost universal partiality farm-yard manure in preference to most artificial fertilizers.

A portion of the results are summarized in the following table:

TABLE IX.

How treated.	1883.		1884.	
	No. of plots.	Average yield per acre, bushels.	No. of plots.	Average yield per
Unfertilized	3	31.5	8	4
Farm-yard manures	2	33.8	8	5
Special wheat manure	4	41.8	3	4
Nitrate of soda, muriate of potash, rock phosphate, separately and mixed in varying proportions	8	31.8	8	4
Fertilizers applied in spring (see Table VI)	....	....	3	5

It will be seen from the above table that the special wheat manure gave largest yield in 1883. The wheat on the plots receiving this fertilizer gr very rank and vigorous in the fall, and withstood the severities of the win better than that on other plots.

Another thing in favor of these plots was the fact that the wheat stood well. On the other plots, especially those to which farm yard manures h been applied, the wheat was down badly some time before harvest.

In 1884 the farm-yard manures gave the best results. The wheat on the plots stood up well.

The special wheat manure is manufactured by H. J. Baker & Bro., N York City. All of the other chemical manures were prepared at Station.

The following table presents a complete record of the test of fertilizers for the past year. Plots are indicated by the same numbers used in the diagram:

TABLE X.

No. of plot.	Yield of grain per acre.	Weight of measured bushels.	Yield of straw per acre.	Weight of straw per 100 lbs of grain.	Date of ripening.
1 A	44.4	62.0	3,960	146	June 28
1 B	48.4	63.5	4,206	145	30
2 A	46.6	63.0	4,464	160	28
2 B	45.2	63.0	4,270	158	30
3 A	48.8	61.0	4,066	137	28
3 B	42.0	63.0	4,206	167	30
4 A	49.4	63.0	4,858	164	28
4 B	43.4	62.0	5,400	207	30
5 A	47.8	64.0	5,118	178	28
5 B	44.2	63.0	4,524	171	30
6 A	40.8	63.5	4,455	182	28
6 B	45.2	63.5	4,075	150	30
7 A	39.3	62.5	4,654	197	26
7 B	47.1	63.5	4,540	161	30
8 A	47.4	64.0	5,016	176	28
8 B	40.3	64.0	3,738	155	30
9 A	42.8	63.5	4,473	174	28
9 B	44.5	63.5	4,035	150	July 1
10 A	46.0	63.5	4,850	176	June 28
10 B	43.8	63.5	4,082	155	July 1
11 A	52.4	63.0	5,660	180	June 28
11 B	47.8	64.0	4,604	161	July 1
12 A	47.4	62.5	4,702	165	June 28
12 B	41.6	64.0	3,828	153	July 1
13 A	55.4	63.5	5,630	169	1
13 B	49.7	63.5	4,464	150	1
14 A	57.0	63.0	5,410	158	1
14 B	48.4	64.5	4,038	139	1
15 A	60.2	63.5	5,942	165	1
15 B	51.5	65.0	5,110	165	1
16 A	55.6	64.5	5,282	158	1
16 B	46.0	64.0	3,550	128	1
17 A	59.7	63.5	5,252	146	1
17 B	....	....	....	....	....
18 A	56.8	64.0	5,300	155	July 1
18 B	41.5	63.0	3,312	133	1
19 A	40.7	63.0	4,464	183	June 28
19 B	43.5	63.5	4,992	191	28
20 A	35.8	65.0	5,457	254	26
20 B	41.3	63.0	5,190	209	28
21 A	41.8	63.0	4,064	162	26
21 B	41.5	63.0	4,984	200	26
22 A	38.5	62.0	5,141	223	26
22 B	40.0	62.5	5,236	218	26
23 A	48.1	....	5,196	180	28
23 B	45.1	63.0	5,591	207	26
24	54.3	63.0	5,454	167	July 1

It is the wish of the Station that the results of the tests published above carefully studied. The instruction they give, although fragmentary, is sug tive. Any attempt to complete it by dogmatic assertions or sweeping gene izations might tend to mislead rather than correctly guide. One lesson is dent and that is, there is little risk of any farmer ever making too much m ure, or applying too much of his own manufacture, while he may impover himself by the purchase and application of commercial fertilizers. Furt discussion of this subject will be deferred until a general summary of results of our wheat experiments is presented.

METHODS OF SEEDING.

The following table gives the results of a series of experiments in differ methods of seeding. Plots 1 and 2 were situated side by side, but not con uous with the other plots, being on the opposite side of the center road.

TABLE XI.

No. of plot.	How sown.	Yield per acre—bushels.	Weight per measured bushel.	Yield of straw per acre—pounds.	Weight of straw
1	Lois Weedon	57.5	63.5	5,754	
2	Ordinary	44.0	63.5	4,436	
3	Ridge drill, 1 peck	37.5	63.5	3,850	
4	Ridge drill, 2 pecks	38.1	64.0	3,463	
5	Ridge drill, 3 pecks	43.4	63.5	4,403	
6	Ridge drill, 4 pecks	39.4	63.5	4,704	
7	Ridge drill, 5 pecks	38.4	62.5	4,708	
8	Broadcast, 5 pecks	37.4	63.5	4,407	
9	Common drill, 5 pecks	37.9	63.0	4,183	

What is termed the Lois-Weedon system in Plot 1 may be described as f lows: A plot is divided into strips of one drill width, and three strips a alternately cropped and cultivated. In other words, the wheat this year w raised upon strips that were cultivated or summer-fallowed the year before a which will be treated in the same manner next season. One-half of the grou being in fallow and one-half in wheat each year. This test will be continu for a series of years to show the effect of thorough cultivation without fertilizers.

Plot No 2, marked "ordinary," will be cropped continuously for the sake of comparison.

The "ridge culture" is a repetition of the tests of last year, made under more favorable circumstances. The different amounts of seed used per acre are shown in the table.

In Plots 7, 8 and 9 the amount of seed used on each was the same, and the plots were side by side—making the conditions, except in method of seeding, as nearly equal as possible. The difference in yield is slightly in favor of the "ridge culture."

One interesting fact is the large yield of wheat by "ridge culture," where only one peck of seed per acre was used. This illustrates the advantages claimed for this system, which may be summarized as follows: (1). A more perfect distribution of seed. (2). A better utilization of the surface soil. (3). A more perfect surface drainage. The wheat in these tests was sown by a Ridge Drill, invented and manufactured by Mr. J. W. Sohn, of Hamilton, O. By means of this implement the seed is distributed directly upon the surface in drill rows six inches wide. It is covered by a series of hoes or shovels which leave a distinct furrow between the seed beds.

WHEAT TESTS IN DIFFERENT PARTS OF THE STATE.

Pursuing the plan adopted the previous year the Station again sent out wheat to different sections of the State for testing. Less than one-half of those receiving seed reported.

The plan of this work, briefly stated, is—

1st. A simple comparative test of the several varieties upon different soils and under different climatic conditions.

2d. The general distribution of the more valuable varieties to the farmers of the State.

3d. To incite our farmers to observe more closely and experiment more carefully for themselves, and thus lead them to take a greater interest in the work of the Station.

STATEMENT EXHIBITING RESULTS OF WHEAT TESTS IN DIFFERENT PARTS OF THE STATE.

County.	Name of party making the tests.	Variety.	Soil.	Time of sowing.	Time of ripening.	Amount of seed sown.	Amount of grain harvested.		Quality of grain.	Weight per bushel.
				1883.	1884.		Bu.	Lbs.		Lbs.
Fulton	Albert Deyo	York White Chaff	Clay loam	Oct. 1	July 11	1 bu.	22	40	Good.	62
Fulton	Albert Deyo	Champion Amber	Clay loam	1	11	43 lbs.	16	30	Fair.	60
Butler	John Earheart	Velvet Chaff	Clay upland	5	4	1 bu.	24	20	Good.	61
Brown	B. W. Gordon	Velvet Chaff	Clay	Sept. 24	3	1 bu.	7	0	Fair.	63
Auglaize	J. H. Fink	Velvet Chaff	Clay loam	Oct. 9	6	½ bu.	10	0	Good.	61
Fulton	Jno. H. Schrider	Velvet Chaff	Clay and sand	Sept. 19	8	1 bu.	14	25	Fair.	64
Fulton	Jno. H. Schrider	Finley	Clay and sand	19	8	2 qts.	1	30	Fair.	62½
Medina	Geo. Burr	Velvet Chaff	Sandy loam	22	June 30	1 bu.	30	0	Very good.	63½
Ashland	G. W. Ryall	Velvet Chaff	Clay	18	July 4	1 bu.	18	0	Very good.	66
Ashland	G. W. Ryall	Finley	Clay	18	4	2 qts.	1	51	Very good.	65½
Lake	E. W. Taylor	Velvet Chaff	Clay and gravel	14	7	1 bu.	20	0	Good.	63
Lake	E. W. Taylor	Egyptian	Clay and gravel	14	10	1 bu.	18	0	Fair.	61
Summit	A. D. Betz	Einley	Gravelly, sandy loam	Oct. 1	9	2 qts.	3	6	Very good.	61½
Montgomery	Joshua Mills	Velvet Chaff	Clay	Sept. 24	8	2 bu.	25	0	Good.	60

This brief statement presents a summary of the more important points contained in the reports received. Most of them were accurately filled out, yet there is room for improvement. A bushel of wheat always means 60 pounds. Several reported yields by measure which, if not understood is misleading. The weight per bushel should always be struck measure. Some report the quality only " fair " and give the weight above 63 pounds per bushel, which would indicate probable carelessness. When it is understood that these reports are for the information and guidance of others, they cannot be made with too great exactness.

It will be seen from the above tabulated statement that in one instance two quarts of seed yielded over three bushels of wheat. Should the next crop be equally good over one hundred bushels might be reasonably expected. This statement is made in order to show those that who object to small quantities of seed, how rapidly it multiplies.

The following notes are quotations from the several reports:

Fulton County.—Deyo: "no manure used;" "York White Chaff compares very favorably with other varieties here." "Champion Amber not good as seed sown." Schneider: "manured, 12 loads per acre;" "sowed too late;" "quality not as good as that sown;" "not injured by weevil."

Butler County.—"Clay upland, second crop of wheat; quality better than that sown."

Brown County.—"Soil very poor, clay land, badly run down;" one bushel on one acre with 100 pounds Bowker's acid phosphate;" "quality about equal to seed."

Auglaize County.—"Seed came too late;" "sowed on corn stubble;" "quality good as seed;" "better than other varieties here."

Medina County.—"Top-dressed with manure at the rate of 20 loads per acre;" "quality better than that sown;" "yield above average here."

Ashland County.—"High dry land;" "oat's stubble; "manured before plowing;" "quality good as sown and equal to the best grown here."

Lake County.—"Used 150 pounds per acre of Cleveland Packing House Phosphate; "Velvet Chaff stood the winter best of any variety with me, and is good as seed sown. Egyptian not so good."

Summit County.—"Alsike clover sod;" "no fertilizers;" "part drilled and part broadcasted, drilled was best;" "tillered well;" "quality better than Fultz, Velvet Chaff, or Democrat."

Montgomery County.—"Ground was previously in tobacco, and treated with stable manure;" "quality better than that sown, and better than any grown here"

ADDITIONAL WHEAT REPORT.

Mr. Geo. Burr, of Lodi, Medina county, makes the following report, to Station, of his experiments in wheat the past season.

REPORT OF EXPERIMENTS IN WHEAT MADE TO THE OHIO STATE EXPERMEN STATION.

These various kinds of wheat was sown in plots of 198 square feet, 5 ou of seed was sown on each plot, or at the rate of 68 pounds per acre. seeding was done on September 28 and 29 with a hand drill. The soil is sa loam with a little gravel and not naturally very strong; there was a light ond crop of clover plowed down on September 7. The ground was thorou worked and top-dressed with well-rotted barn-yard manure at the rate of 20 horse loads per acre:

Variety of wheat.	Color of grain.	Time of ripening.	Quality of straw.	Smooth or bearded.	Yield
					Bu.
Treadwell	Amber	July 4	Medium	Mixed	29
Landreth	White	" 6	Stiff	Smooth	35
Martin's Amber	"	" 6	"	"	27
York White Chaff	Amber	" 4	"	"	34
Smith's Scott	Red	" 2	Medium	"	39
Theiss (received from Ohio State Experiment Station, 1883)	"	" 1	Weak	Bearded	34
Rice (received from Ohio State Experiment Station, 1883)	"	" 1	Stiff	Smooth	33
Velvet Chaff	"	June 29	"	Bearded	21
Bennett	Amber	July 2	Medium	"	20
Wild Goose.	"	" 3	Stiff	Mixed	25
Champion Amber (received from Ohio State Experiment Station, 1883)	Red	" 3	"	Smooth	33
German Amber (received from Ohio State Experiment Station, 1883)	"	June 30	"	"	22
Zimmerman	"	July 4	"	"	31
Fultz	"	June 30	"	"	27
Todd	"	July 3	"	"	30
Rogers	"	" 4	"	"	29
Spark's Swamp	"	" 1	Weak	Bearded	32
California Blue Stem	"	" 1	"	"	30
Tasmanian Red	"	" 1	"	"	28
Lancaster	"	June 30	"	"	30
igger	"	July 1	Medium	"	26
Mediteranean	White	June 30	"	"	28

Variety of wheat.	Color of grain.	Time of ripening.	Quality of straw.	Smooth or bearded.	Yield per acre.	
					Bu.	*Lbs.*
Royal Australian	White	July 2	Stiff	Smooth	37	7
Democrat	"	" 2	Medium	Bearded	37	48
Wayne County Select	"	June 30	"	"	38	2
Golden Prolific	"	July 1	Stiff	"	34	8
Canada Club	"	June 30	"	"	34	50
Sandomirka	"	July 2	Medium	Smooth	27	2
Egyptian (received from Ohio State Experiment Station, Station, 1883)	Red	" 2	"	Bearded	31	51
Finley	"	June 30	Stiff	Smooth	35	3
Red Velvet	"	July 1	"	"	32	32
Heighe's Prolific	"	June 30	"	"	28	11

The Velvet Chaff was in full bloom on my experimental grounds the night of May 28, and was injured about 50 per cent. by the severe frost; in the same field, on a colder soil, where the wheat was not so forward it yielded 38 bushels per acre, and that without the aid of any manure or fertilizers of any kind.

The German Amber and Fultz were damaged about 5 per cent., and Hedge's Prolific about 10 per cent. by the frost. No other damage was noticed.

There was no perceptible difference in the wintering of the different varieties, as they were all well protected. No signs of disease. The Bennett and Sandomirka crinkled down bad, apparently the work of the Hessian fly.

Yours respectfully,

GEO. BURR,
Lodi, Medina county, Ohio.

A FIVE YEARS' TEST OF VARITIES.

	Yield and weight per bushel of varities of wheat grown on the Ohio State University Farm.					Yield and weight per bushel of varieties of wheat grown on the Station grounds.			
	Bushels per acre.			Weight of bushel—lbs.		Bushels per acre.		Weight of bushel—lb	
	1880.	1881.	1882.	1881.	1882.	1883.	1884.	1883.	1884.
American White	....	19.0	21.0	59.5	59.5	....	....	....	......
Arnold's Gold Medal	31.0	19,5	27.0	60.0	56.0	....	....	....	......
Bearded Treadwell	....	....	....	....	....	33.1	33.0	59.0	61.5
Bennett	....	....	28.5	....	62.0	*32.1	29.4	*58.5	63.0
Champion Amber	....	23.0	21.0	57.5	56.0	36.9	36.9	58.5	58.0
Clawson	26.6	23.0	27.0	59.0	57.0	36.7	35.8	58.0	58.0
California Blue Stem	....	....	24.0	....	59.0	....	....	....	......
Democrat	....	....	....	....	....	*45.5	35.9	*60.0	61.0
Egyptian	....	22.0	27.0	59.0	59.0	39.8	30.6	61.0	61.0
Finley	....	....	24.5	....	58.5	42.8	30.1	62.0	61.0
Fultz	27.0	21.5	19.5	61.0	61.0	35.1	36.7	61.0	60.5
German Amber	....	24.5	21.0	62.5	57.0	25.9	....	58.0	......
Gold Drop	....	....	....	....	....	....	33.6	....	60.5
Golden Straw	28.0	19.5	19.5	60.5	62.0	30.0	37.1	60.5	60.5
Grecian	....	20.0	24.0	58.5	59.5	29.7	*31.0	57.5	......
Heighe's Prolific	....	19.0	21.0	61.5	59.0	*43.0	34.2	*58.0	60.5
Hungarian	....	21.0	28.5	62.0	59.5	....	....	....	......
Indiana Swamp	....	23.5	27.0	61.0	58.0	....	....	....	......
Lancaster	....	23.5	27.0	57.0	60.0	29.9	28.9	58.5	61.0
Landreth	....	....	....	....	....	....	31.6	....	60.5
Mammoth Red	....	12.5	27.0	57.5	60.0	....	....	....	......
Martin's Amber	....	....	....	....	....	....	45.2	....	61.5
McPherson	....	....	....	....	....	....	26.9	....	60.5
McGhee's Red	....	26.0	25.5	62.0	58.0	*40.6	33.3	*57.0	61.0
McGhee's White	....	....	....	....	....	....	28.8	....	62.0
Mediterranean	....	21.5	27 0	59.0	59.5	34.7	31.1	58.0	61.5
Mediterranean, Imported	....	....	....	....	....	....	29.6	....	......
Michigan Amber	....	21.5	24.0	59.5	59.0	....	33.3	....	60.0
Michigan Bronze	....	....	....	....	....	....	39.2	....	61.0
New Zealand	....	....	27.0	....	56.0	....	....	....	......
Nigger	....	....	....	....	....	....	36.6	....	63.0
Ostrey	....	....	....	....	....	*36.4	....	*59.0	......
Pool	....	....	....	....	....	....	32.6	....	56.5
Red Amber	....	25.5	22.5	61.0	59.5	....	....	....	......
Red Fultz	....	....	....	....	....	....	38.2	....	60.5
Rice	....	....	27.0	....	58.0	33.9	39.9	59.0	60.5
Rickenbrode	....	19.5	10.5	58.5	59.5	....	....	....	......
Rocky Mountain	....	....	....	....	....	*35 3	40.1	*57.0	62.0
Rodgers	....	....	....	....	....	*37.6	....	*55.5	......
Royal Australian	....	....	....	....	....	....	40.2	....	57.5
Russian May	....	....	28.5	....	62.5	35.3	31.9	59.0	60.5
Russian No. 2	....	17.0	30.0	62.5	62.0	....	....	....	......
Sandomirka	30.0	26.5	28.5	63.0	63.0	37.1	28.9	60.0	60.5
Siberian	....	26.5	25.5	61.5	61.0	....	....	....	......
Silver Chaff	33.0	26.0	28.5	59.5	52.5	26.8	39.7	58.5	60.0
Smith's Improved	....	16.5	21.0	59.5	60.0	....	....	....	......
Smooth Scott	....	26.5	25.5	61.5	61.0	*35.9	....	*54.5	......
Smooth Treadwell	....	....	....	....	....	*36.2	35.8	*54.0	60.0
Tappahannock	....	16.5	24.0	61.0	63.0	....	....	....	......
Tasmanian Red	....	....	....	....	....	....	49.6	....	62.0
Tennessee Amber	....	....	....	....	....	*30.0	....	*59.0	......
Theiss	....	25.0	16.5	62.5	59.0	35.7	29.4	59.0	61.5
Travis	....	....	18.5	....	60.0	27.5	*33.5	59.0	......
Valley	....	....	....	....	....	....	38.1	....	61.5
Velvet Chaff	28.0	22.5	27.0	64.0	64.0	36.8	33.3	62.5	62.5
Washington Glass	....	....	27.0	....	56.0	....	....	....	......
Wayne County Select	....	....	....	....	....	*48.0	26.4	*56.0	59.0
White Blue Stem	....	....	22.5	....	57.5	*44.3	....	*57.5	......
White Eldorado	....	....	21.0	58.0	....	....	....	....	......
White Glass	....	....	27.0	....	58.0	....	....	....	......
White Rogers	....	....	....	....	....	....	33.5	....	61.5
White Velvet	....	....	....	....	....	....	31.6	....	61.0
Yellow Blue Stem	....	....	21.0	....	60.0	*45.2	....	*58.0	......
Yellow Missouri	....	12.0	16.5	57.5	57.0	....	....	....	......
York White Chaff	....	26.0	21.0	59.0	61.0	38.4	42.3	59.0	60.5
Zimmerman	....	26.0	30.0	61.0	58.5	33.6	36.0	59.5	59.0

* Taken from farm report of the Ohio State University.

The following averages are taken from the foregoing table:

AVERAGE YIELD AND WEIGHT OF RED AND WHITE WHEAT.

	Average yield per acre.	Average weight per bushel.
Red	30.0	59.6
White	30.3	59.5

AVERAGE YIELD AND WEIGHT OF SMOOTH AND BEARDED WHEAT.

	Average yield per acre.	Average weight per bushel.
Smooth	28.8	59.3
Bearded	27.3	60.4

This comparison is not between an equal number of varieties of each, for about two thirds of our varieties are red, and about the same number are smooth.

VITALITY OF SELECTED HEADS OF WHEAT.

Large, medium, and small ears were selected from about eighteen varieties of wheat and their vitality tested, with the following results:

Class of wheat.	Average per cent. germinated.			
	Selected heads.	Medium heads.	Smallest heads.	Average of all heads.
Red varieties	98.7	96.9	94.0	96.5
White varieties	97.2	98.6	96.4	97.4
Bearded varieties	99.8	99.0	98.3	99.0
Smooth varieties	97.1	98.0	93.8	96.3

GENERAL NOTES ON WHEAT.

This important cereal crop is now cultivated in all parts of the world, and is one of the principal articles of human food. Although so widely disseminated, nowhere is wheat found growing wild. It was derived from a wild form of grass, and can only be improved and maintained by careful culture.

One of the most significant facts in wheat production in this country is the increase per capita, despite the remarkable increase in population.

In 1850 the yield was 4.3 bushels for every inhabitant. In 1860 it was 5.5 bushels. In 1870 the total product reached 7.3 bushels per capita. In 1880 it was 9.2 bushels. Last year, 1884, it reached the remarkable figure of 10 bushels for each individual.

About 5 bushels per capita is the amount required for home consumption, or just one-half of last year's harvest.

Another interesting fact is the rapid removal westward of the center of wheat production.

In 1850 Pennsylvania was the largest wheat producing State, Ohio standing second in the list. In 1880 Illinois ranked first, Indiana second, and Ohio third. In 1884 California stood first, Minnesota second, while our own State still held the third place. . Ohio is specially favored for wheat production, and has attained the comparatively high average of 19 bushels per acre. This ought to be increased, and it surely will, if the farmers of the State intelligently resolve that it shall be done. A more careful selection of seed, better drainage, thorough preparation of the soil, and more liberal fertilizing can scarcely fail to secure this desired end.

The Station expects to continue its experiments with wheat, aiming to show how varieties may be improved, the yield increased, and the cost of production diminished.

REPORT ON OATS.

The following varieties of oats were grown at the Station last year, on plots of one-sixteenth of an acre each. Soil a clayey loam, moderately fertile. The seed germinated well in every instance, but owing to the severe drouth the straw was short and the yield of grain small in quantity, though of fairly good quality.

Variety.	Yield of grain per acre.	Yield of straw per acre.	Weight of measured bushel.	Color of grain.	Date of ripening.
	Bu.	*Lbs.*	*Lbs.*		
Rust Proof	57.3	2,008	30.0	Light brown.	July 15
American Triumph	60.0	4,160	31.0	White.	" 23
White Belgian	68.5	3,568	36.5	White.	" 15
White Canadian	63.3	1,855	33.0	White.	" 15
White Russian	59.3	3,275	31.0	White.	" 23
Welcome	69.5	3,856	39.5	White.	" 12
White German	65.3	2,520	32.0	White.	" 15
Welch	56.7	2,984	32.0	White.	" 15

It was observed that all the varieties stooled slightly, except the Welcome, which did not stool at all. This variety presented a fine appearance when growing, stood up well and gave the largest yield of grain. With the exception of the American Triumph and Welcome, the yield of straw of the different varieties is light. White Canadian gave a greater weight of grain than of straw.

In addition to the varieties named above, quite a number were grown in small plots for the purpose of study and comparison. These were so badly injured by the drought that no satisfactory report can be given.

CORN EXPERIMENTS.

This work for the year 1884 was conducted on the same general plan as given in previous reports. It embraces the following general divisions, viz:

1. Comparison of varieties.
2. Planting at different depths.
3. Thick and thin seeding.
4. Methods of culture.
5. Application of fertilizers.

TEST OF VARIETIES.

Varieties of corn, unlike wheat, mix or cross-fertilize very freely when planted near each other. This makes the practical comparison of different varieties on the same ground a matter of much difficulty.

According to the classification given in the last report, the varieties used this year may be arranged as follows:

	Race.	*Class.*	*Types.*	
Indian Corn (*Zea Mays*)	1. Dent	1. Yellow	1. Large	1. Leaming.
				2. Chester County Mammoth.
				2. Bounds.
				3. Winter's Dent.
			2. Medium	1. Scott's Dent.
				2. Wright's Golden.
				3. Gourd Seed.
				4. New Prolific.
				5. Farnsworth.
			3. Small	1. Clarage.
				2. Golden Gem.
				3. Queen of the Prairie.
		2. White	1. Large	1. Egyptian.
			2. Medium	1. Pearl White.
			3. Small	1. Blount's Prolific.
	2. Flint	1. Yellow	1. Large	1. Long Yellow.
			2. Medium	1. Longfellow.
			3. Small	1. King Philip.
		2. White	1. Large	1. Long White.

TABLE I.—SHOWING THE RESULTS OF THE FOREGOING WORK.

No. of plot.	Variety.	Bushels sound corn, 70 pounds each.	Bushels soft corn, 70 pounds each.	Total bushels of corn.	Weight of stalks—pounds.	Weight of stalks to 100 pounds of corn—pounds.	Per cent. of ears.	Per cent. of nubs.	Time of ripening.
									1884.
1	Leaming	70.9	0.0	70.9	2,720	55	83	17	September 10
2	Scott's Dent	70.9	0.0	70.9	2,856	58	86	14	" 12
3	Wright's Golden	66.0	1.0	67.0	2,992	64	87	13	" 12
4	Bounds	66.0	0.0	66.0	2,040	44	77	23	" 12
5	Egyptian	67.0	0.0	67.0	4,760	102	64	36	" 20
6	Gourdseed	37.9	0.0	37.0	1,360	51	35	65	" 1
7	Golden Gem	46.6	0.0	46.6	2,312	72	64	36	" 15
8	Winter's Dent	57.9	2.9	60.8	2,448	58	53	47	" 10
9	Barton	21.4	0.0	21.4	1,360	91	60	40	" 12
10	New Prolific	41.1	0.0	41.1	1,584	56	61	39	" 5
11	Farnsworth	23.3	1.0	24.3	1,360	80	10	90	" 15
12	Chester County Mammoth	36.0	6.1	42.1	1,728	60	34	66	" 15
13	Clarage	22.3	0.0	22.3	1,493	98	20	80	" 15
14	Queen of the Prairie	27.8	0.0	27.8	1,296	66	33	67	" 15
15	Pearl White	33.5	2.9	36.4	1,493	58	56	44	" 12
16	Blount's Prolific	33.9	2.1	36.0	2,160	88	73	27	" 25
17	Long Yellow Flat	35.9	0.0	35.9	2,312	92	80	20	" 10
18	Long White	41.8	0.0	41.8	1,904	65	80	20	" 5
19	Longfellow	24.3	0.0	24.3	1,024	65	50	50	" 1
20	King Philip	18.5	0.0	18.5	2,160	166	34	66	" 1

TABLE V.

Number.	*Variety.	Average length of ears.	Average number of rows.	Average number of kernels in a row.	Average number of kernels on an ear.	Average diameter of ear.			Average diameter of cob.	Weight of average ear.	Weight of corn on average ear.	Weight of average cob.	No. of ears in one bushel, on cob (70 lbs).	No. of ears in one bushel, shelled, (56 lbs).
						Butt.	Middle.	Tip.						
		inches				inches.	inches.	inches.	inches.	ounces.	ounces.	ounces.		
1	Leaming	7.6	20	37	740	2 4-16	2 3-16	1 14-16	1 5-16	10¼	8¼	2	109	109
2	Scott's Dent	7.9	16	44	704	2 2-16	2	1 10-16	1 2-16	8 4-7	7 1-14	1 5-14	130	127
3	Farnsworth	5.7	20	34	680	1 15-16	1 13-14	1 10-16	1 3-16	5½	4 11-14	10-14	204	187
4	Chester Co. Mammoth	7.0	18	38	684	2 3-16	2 2-16	1 13-16	1 5-16	7 3-7	6½	13-14	151	138
5	Wright's Golden	7.8	14	47	658	1 15-16	1 14-16	1 11-16	1 1-16	8 2-7	7	1 2-7	135	128
6	Bounds	8.3	16	48	768	2 1-16	1 9-16	1 4-16	1 1-16	7½	7 3-14	4-14	150	124
7	Clarage	6.0	14	34	476	1 12-16	1 11-16	1 8-16	15-16	4 6-7	4 1-7	5-7	231	216
8	Queen of the Prairie	6.6	14	37	518	1 10-16	1 8-16	1 5-16	1 1-16	4½	3½	1	250	256
9	Egyptian	7.0	18	42	756	2 4-16	2 3-16	1 15-16	1 4-16	8½	7 1-7	1 5-14	134	125
10	Gourd Seed	6.2	18	40	720	2	1 14-16	1 9-16	1 2-16	6	5 1-7	6-7	187	174
11	Pearl White	6.7	14	42	588	2 1-16	2	1 13-16	1 2-16	7 9-14	6¼	3-7	151	143
12	Blount's Prolific	6.8	10	41	410	1 9-16	1 8-16	1 7-16	1	4¼	3½	¾	264	256
13	Long or Yellow Flint	......	......	......	......	......	......	......	......	......	......	......	......	......
14	Long White Flint	9.6	8	53	424	1 7-16	1 6-16	1 4-16	1	5¾	4 6-7	6-7	195	187
15	Longfellow	8.1	8	46	368	1 7-16	1 6-16	1 4-16	13-16	3 11-14	3	11-14	290	298
16	King Phillip	6.7	8	35	280	1 6-16	1 6-16	1 4-16	1 4-16	3¼	2 9-14	8-14	345	340
17	Golden Gem	7.6	16	45	720	2 2-16	2	1 10-16	1 3-16	8½	7 3-14	1 4-14	134	124
18	Winter's Dent	6.7	16	36	576	2 3-16	2	1 12-16	1 6-16	8¼	6¾	1½	136	133
19	Barton	......	......	......	......	......	......	......	......	......	......	......	......	......
20	New Prolific	7.0	10	45	450	1 14-16	1 11-16	1 8-16	14-16	5 5-7	5	5-7	196	179

* These figures are made entirely from crop of 1884.

DESCRIPTIVE NOTES OF VARIETIES.

The following notes, while of a general nature, refer directly to the growth of the varieties the past season:

Leaming.—Large Yellow Dent.—Plant 5 to 7 feet high, strong and leafy, usually stands well. Ear 6 to 10 inches long, 16 to 24 rows, usually tapering with full large butt, well filled over at points, average diameter 2 inches, cob red, and usually more than half the ear in diameter, kernels evenly dented with very slight furrow between the rows, even, rectangular shape and deep, light orange above and deep orange below. Usually one good ear, sometimes two. Ripens 90 to 110 days in this latitude.

Scott's Dent.—Medium Yellow Dent—Similar to preceding, rather more leafy, stalks not quite so strong, ear quite uniform in butt and tip diameter, well filled at points, length 7 to 9 inches, diameter 1¾ to 2 inches, rows 14 to 18, slight furrow between the rows, unevenly dented with strong tendency to roughness of exterior, kernels flat and deep, light orange above and medium orange below; general character of ear strong and firm. Quite well marked variety, suited to Central Ohio, and could doubtless be readily acclimated farther north.

Farnsworth.—Medium Yellow Dent—No especial description given; did not do well the past season.

Chester County Mammoth.—Large Yellow Dent—A large, coarse growing variety, with short thick ears, 16 to 24 rows each; quite uniform in diameter at tip and butt, smooth exterior evenly dented, pale orange above and orange below, kernels not deep. Tested three years, with unfavorable results; apparently not well suited to Central Ohio.

Egyptian.—Large White Dent—Plant very rank and strong, ears 6 to 10 inches in length, 2 to 2¼ inches in diameter, cob small, kernel very deep, not evenly dented, exterior rough. A very fair looking variety. Ripens too late for Central or Northern Ohio, but ought to give large returns where season is suited to it.

Pearl White.—Medium White Dent—A fair medium type of white dent, no particularly distinguishing characteristics. Probably well suited to most parts of Ohio.

Blount's Prolific.—Small White Dent—A very characteristic variety, plants tall, heavy leaved, two and three ears to each stalk, ears 5 to 9 inches long, 8 to 14 rows, well marked furrow between the rows, evenly dented and smooth exterior, kernels medium depth, small white cob, average diameter of ear 1½ inches. From three years' test we would pronounce this good fodder corn. Not valuable for general crop. Very late.

Wright's Golden.—Medium Yellow Dent—Very similar to Scott's Dent, except that the ears have a smooth exterior. A good variety for Central Ohio and farther North.

Bounds.—Large Yellow Dent—Type not sufficiently well fixed for accurate description. A fair, promising variety.

Clarage.—Small Yellow Dent—Plant medium height, rather slender, ear 6 to 8 inches long, 12 to 16 rows. A fair, small variety. Ought to do well in Central and Northern Ohio.

Queen of the Prairie.—Small Yellow Dent—A quite small dent corn, ears evenly dented, smooth and very closely filled, 5 to 8 inches long, 12 to 18 rows. Quite well marked variety. Probably not a desirable sort for Ohio or any Western State south of latitude 42°.

PLANTING AT DIFFERENT DEPTHS.

These tests occupied three ordinary field plots, each one being cut into seven sections. By reducing the size of the plots greater accuracy was secured. Each series was planted at intervals of one week. The soil, a clayey loam, was thoroughly prepared, and was in excellent condition May 22, the date of planting the first plot.

The depths were gauged with rule, and ranged from one to six inches. One plot, not named in the tabulated statement, was planted twelve inches deep. In this plot very few plants came up, and no report of yield is made.

The following table presents the yield of corn and stalks of the several plots:

TABLE II.—Yield of Corn as Weighed from Field.

Depth of planting.	Planted May 22, 1884.			Planted May 29, 1884.			Planted June 5, 1884.		
	Bushels sound corn.	Bushels soft corn.	Total bushels corn per acre.	Bushels sound corn.	Bushels soft corn.	Total bushels corn per acre.	Bushels sound corn.	Bushels soft corn.	Total bushels corn per acre.
1 inch.....	47.2	0.0	**47.2**	34.7	1.6	**36.3**	22.6	3.5	**26.1**
2 inches..	45.1	0.0	**45.1**	32.9	0.0	**32.9**	31.2	2.6	**33.8**
3 inches.	38.2	0.0	**38.2**	30.3	0.0	**30.3**	13.9	3.5	**17.4**
4 inches..	36.5	0.0	**36.5**	22.6	0.0	**22.6**	7.8	5.2	**13.0**
5 inches..	32.0	0.0	**32.0**	19.0	0.0	**19.0**	1.7	1.7	**3.4**
6 inches..	27.7	0.0	**27.7**	26.9	0.0	**26.9**	3.5	5.2	**8.7**

TABLE II.—CONTINUED—WEIGHT OF STALKS, ETC.

Depth of planting.	Planted May 22, 1884.			Planted May 29, 1884.			Planted June 5, '84.		
	Weight of stalks per acre.	Per cent. of ears.	Per cent. of nubs.	Weight of stalks per acre.	Per cent. of ears.	Per cent. of nubs.	Weight of stalks per acre.	Per cent. of ears.	Per cent. of nubs.
1 inch	2,189	46	54	1,459	32	68	2,189	24	76
2 inches	2,189	52	48	1,459	30	70	2,189	26	74
3 inchds	1,946	43	57	1,216	30	70	1,216	52	48
4 inches	1,702	53	47	973	40	60	973	31	69
5 inches	1,702	23	77	729	42	58	486	33	67
6 inches	1,459	30	70	1,216	27	73	729	26	74

These plots were all planted three and one-half feet apart each way and were thinned to three stalks in a hill. Frequently, however, the stand was not perfect; this is taken into consideration in Table III. The yields in Table II are actual, as weighed from the field, and the percentages of ears and nubs were made by count at the time of husking. First planting shows no soft corn and an average total yield of 37.8 bushels per acre; second planting a very little soft corn and a total average yield of 28.1 bushels; third planting, soft corn in every plot, and a total average yield of 17 bushels. First planting shows highest yield at one inch deep and lowest at six inches deep. The decrease is quite uniform and gradual from shallowest to deepest planting. Second planting shows highest yield at one inch and lowest at five inches. The third planting shows highest yield at two inches and lowest at five. It will be noticed that all plots show the greatest development of ear at some point below the greatest yield. The following from "field notes" will be interesting in connection with the work:

First planting, May 22, 1884; bright, fair weather, with mean temperature of about 60° Fah. for some days previous to planting. "May 27, one, two, and three inches coming through to-day; very heavy storm, 1.24 inches of rain fell;" "mean temperature down to 49°." "June 5, all through today, up to six inches; looks quite even to five inches; six is weak; a few sprouts of twelve inches breaking through;" "mean temperature risen to 68°." "June 11, all looks well up to six inches, that is a little weak; injured some by moles;

twelve inches, only two or three stalks standing; injured very much by moles."

Second planting, May 29; no rain during period of vegetation of this plot. "June 5, one and two inches through." "June 7, all through up to five inches." "June 11, six inches is coming through; moles have injured all the deeper plantings considerably."

Third planting, June 5. "June 11, one and two inches through." "June 16, three and four partly through." "Have had about two-fifths of an inch of rain since May 27." "June 20, five and six coming very slowly; much injured by moles."

The following table gives the per cent. of perfect stand harvested, the corrected yield, and the weight of stalks to one hundred pounds of corn. The per cent. of a perfect stand can be easily and accurately obtained, but the injury which the remaining plants received from the same causes that reduced the stand cannot be estimated.

TABLE III.

Depth of planting.	Planted May 22, 1884.			Planted May 29, 1884-			Planted June 5, 1884.		
	Per cent. of perfect stand which was harvested.	Yield corrected to perfect stand, bushels.	Pounds of stalks to 100 pounds of corn.	Per cent. of perfect stand which was harvested.	Yield corrected to perfect stand, bushels.	Pounds of stalks to 100 pounds of corn.	Per cent. of perfect stand which was harvested.	Yield corrected to perfect stand, bushels.	Pounds of stalks to 100 pounds of corn.
1 inch	100	**47.2**	70	96.7	**37.5**	57	100	**26.1**	120
2 inches	100	**45.1**	69	100	**32.9**	63	98.9	**34.1**	95
3 inches	95.6	**39.9**	73	77.8	**39.0**	55	37.8	**46.0**	100
4 inches	88.9	**41.0**	70	47.8	**47.2**	61	55.6	**23.3**	100
5 inches	96.7	**33.0**	74	50.0	**38.0**	55	27.8	**12.2**	133
6 inches	86.7	**32.0**	75	91.1	**29.5**	62	32.2	**27.0**	90

The greater weight of stalks to 100 pounds of corn is very noticeable in the latest planting. In this connection a few notes on the season will show cause for the low yields of corn in all the experiment work this year: May, a very cold, heavy storm after most of the experiment plots were planted, followed by frost on the 29th. June, total rainfall 1.11 inches, with mean temperature of

71.1°. July, total rainfall 2.23 inches; mean temperature 72.6°. Aug total rainfall .45 of an inch; mean temperature, 71.6°. Thus at the clos the month of August, when the crop should have been nearly matured, ab 3 75 inches of rain had fallen, instead of 9 to 12 inches, the normal rain for the months named. The temperature was also somewhat below the mal, averaging about 71°.

The yield of corn in a similar series of tests made in 1883 is compared those of 1884 in the following table:

TABLE IV.

Depth of planting.	First planting.		Second planting.		Third plant	
	1883.	1884.	1883.	1884.	1883.	1
	Bus.	*Bus.*	*Bus.*	*Bus.*	*Bus.*	
1 inch	94.3	47.2	92.4	36.3	63.6	
2 inches	52.6	45.1	61.8	32.9	62.6	
3 inches	53.6	38.2	43.1	30.3	48.3	
4 inches	50.3	36.5	65.8	22.6	43.3	
5 inches	43.5	32.0	54.5	19.0	46.8	
6 inches	57.9	27.7	67.7	26.9	35.4	

The work of the two years agree in the following particulars: First, in two earlier plantings, the one inch covering is decidedly the best. Seco the yield decreases in a somewhat regular ratio from the shallow towards deeper planting. One point clearly brought out by the Station experiment this: *Uniform covering of the seed is essential to equality of growth.*

THICK AND THIN SEEDING.

The tests under the above heading are, in the main, a repetition of those of former years. Eighteen plots of one-sixteenth of an acre each were devoted to to this work. These plots occupied a continuous piece of ground. The soil is a heavy clay, of quite uniform character, and moderately fertile. The plots were all planted May 23, in rows three and one-half feet apart. Except in manner of seeding, each received precisely the same treatment. The seed was dropped by a tape line, and the distance was exact. The results of the whole series of tests are compiled in the following table:

TABLE VI.

No. of plot.	How planted.	Bushels sound corn.	Bushels soft corn.	Total bushels corn.	Weight of stalks.	Pounds of stalks to 100 lbs. corn.	Per cent. of ears.	Per cent. of nubs.
1	One kernel 6 inches apart..........	19.7	0.5	20.2	2,432	173	1	99
2	" 9 "	32.0	0.0	32.0	2,304	101	19	81
3	" 12 "	36.1	0.0	36.1	1,408	56	20	80
4	" 15 "	40.2	0.0	40.2	1,620	57	50	50
5	" 18 "	43.0	0.0	43.0	1,536	51	63	37
6	" 21 "	42.5	0.0	42.5	1,408	47	73	27
7	" 24 "	41.6	0.0	41.6	1,600	55	85	15
8	Two kernels 12 inches apart........	31.5	0.9	32.4	2,560	110	13	87
9	" 15 "	35.2	0.5	35.7	2,304	92	9	91
10	" 18 "	34.7	0.0	34.7	2,368	97	14	86
11	" 21 "	35.7	0.7	36.4	1,920	74	14	86
12	" 24 "	33.4	0.2	33.6	1,664	70	25	75
13	" 27 "	39.8	0.5	40.3	1,728	61	40	60
14	" 30 "	37.0	0.0	37.0	1,600	62	50	50
15	Three kernels 18 inches apart......	18.7	0.0	18.7	2,688	205	4	96
16	" 24 "	29.7	0.7	30.4	1,984	91	13	87
17	" 30 "	31.1	0.2	31.3	1,920	87	20	80
18	" 36 "	28.8	0.0	28.8	1,472	73	20	80

Owing to the drought the yields fall much below those of last year, but the results point to the same general conclusions. The plants on plot 1 were the smallest, and did not average more than three feet in height. Plot 2, which contained only two-thirds as many plants as plot one, yielded an almost equal weight of stalks. Plots 4 to 7, inclusive, appeared about even in size and vigor of growth.

The results obtained from these plots is a strong argument in favor of thin seeding, where corn is planted for the grain alone. The heaviest yield is obtained with one kernel eighteen inches apart. Attention is called to the development of ears as well as to the total yield.

Many interesting comparisons can be made from the above table example, in plots 1, 8, and 15, exactly the same quantity of seed is used the distribution is varied.

The following comparative tables are arranged from the results of the 1883 and 1884:

Plot.	Year.	How planted.		Bushels.
9	1883	2 kernels 15 ins. apart....	Greatest yield........................	92.1
5	1884	1 kernel 18 inches apart	"	43.0
7	1883	1 " 24 "	Greatest development of ear...	72.9
7	1884	1 " 24 "	" " ...	41.6

The following table gives the best plot from each division of this wor the years 1883 and 1884:

Plot.	Year.	How planted.	Total yield, bushels	Per cent. of ears.	Per cent. of nubs.
2	1883	1 kernel 9 inches apart........................	88.9	33.8	66.2
9	1883	2 kernels 15 inches apart	92.1	34.3	65.7
18	1883	3 kernels 36 inches apart	76.6	68.3	31.7
5	1884	1 kernel 18 inches apart........................	43.0	63.0	37.0
13	1884	2 kernels 27 inches apart........................	40.3	40.0	60.0
17	1884	3 kernels 30 inches apart........................	31.3	20.0	80.0

Any study of the results given in the above tables should take into ac the difference in the amount of rainfall in the two years.

In 1884 the Station records shows that from May 15th until September only 5.4 inches of rain fell.

In 1883, during the same period, the total rainfall was a little over inches.

The proper distance as well as the proper depth at which to plant corn is a subject of much importance, and is dependent upon varying circumstances.

The subject resolves itself two problems, viz.: (1.) What is the area to each plant that will give the largest yield per acre? (2.) With a given area to each plant, what distribution of the plants will give the largest product per acre?

These problems deserve the attention and study of every farmer who raises corn.

The solution can only be made by well planned and carefully executed experiment.

The tests thus far made at the Station show that a slight change in the distribution of seed from the method often practiced, would alone increase the yield from ten to thirty bushels per acre. Such being the case the value of these practical experiments can hardly be overrated.

METHODS OF CULTURE.

The principal object in these tests is to find out something definite in regard to the limit of profitable cultivation of corn. The tests were made on two series, one of five and the other of four plots. Each plot contained one-sixteenth of an acre. The soil is a heavy clay loam. The preparatory tillage was thorough, and was exactly alike for each plot. The corn was planted May 23d, in hills three and one-half feet apart. It came up evenly and made an almost perfect stand.

Plot 1, in each series received no cultivation whatever, and no weeds were removed.

Plot 2*a* was kept free of weeds, but the soil was not stirred.

Plot 3*a* received thorough surface cultivation with a light harrow. It was cultivated at four different dates, viz.: June 11, June 21, July 2, July 17.

Plot 4*a* was cultivated twice with a shovel plow. Once June 11, and again June 21. It received no further care.

Plot 5*a* was cultivated in the same way, June 11, June 21, July 2, July 16 and August 9.

Plot 2*b* was cultivated once, June 11.

Plots 3*b* and 4*b* were treated exactly the same, and like plot 5*a*.

The yield of corn is shown in the following table, and for the sake of comparison the results of the tests of 1883 are added.

TABLE VII.

1884 (First series.)			1884 (Second series.)			Tests of 1883.		
No. of plots.	How treated.	Total bushels of corn per acre.	No. of plot.	How treated.	Total bushels of corn per acre.	No. of plot.	How treated.	Total bushels of corn per acre.
1*a*	Not cultivated or weeded.............	15.1	1*b*	Not cultivated or weeded..........	14.0	1	Not cultivated or weeded	21.7
2*a*	Not cultivated, but kept clear of weeds..................................	18.3	2*b*	Cultivated once with horse hoe..	28.3	2	Cultivated once..............................	29.0
3*a*	Surface cultivation with light harrow	28.4	3*b*	Cultivated five times with same.	30.6	3	Cultivated twice..............................	63.8
4*a*	Cultivated twice with horse hoe or cultivator	35.0	4*b*	Cultivated five times with same..	30.7	4	Cultivated three times................	57.6
5*a*	Cultivated five times with same.....	27.0				5	Cultivated five times..................	49.8

An examination of the soil of the several plots during August, when the drouth was most severe, revealed the following points:

The surface soil of the uncultivated plots was extremely hard, and cracked open in many places.

There was no apparent moisture, and the roots of the plants were much dwarfed. In plot 3*a*, where the surface was thoroughly stirred with the harrow, the ground was mellow on top, and not cracked.

An abundance of fibrous roots was found from one to three inches below the surface. Below this the soil was very hard and dry.

At a depth of ten inches a few rootlets could be found.

In the well cultivated plots the earth was fine and mellow to a depth of from six to eight inches.

Rootlets were easily traced to a depth of fifteen inches.

The following table presents in detail the result of the tests made in 1884:

Number of plot.	Bushels sound corn.	Bushels soft corn.	Total bushels corn.	Weight of stalks.	Weight of stalks to 100 pounds corn.	Per cent. of ears.	Per cent. of nubs.
1 A	15.1	0.0	15.1	960	91	5	95
2 A	18.3	0.0	18.3	832	67	9	91
3 A	28.4	0.0	28.4	1,440	73	30	70
4 A	4.5	0.5	35.0	1,664	68	40	60
5 A	26.3	0.7	27 0	1,248	66	26	74
1 B	13.3	0.7	14.0	864	90	15	85
2 B	27.4	0.9	28.3	1,376	69	35	65
3 B	29.7	0.9	30.6	1,344	63	33	67
4 B	29.3	1.4	30.7	1,440	67	27	73

The results of the Station experiments for the past two years prove beyond a doubt that the yield of corn is frequently lessened by the too frequent and improper use of the cultivator. Rightly used, its value is almost beyond computation.

In the capacity of a root-pruner, it often works serious harm. Deep cultivation of growing corn should only be practiced within certain limits, and performed with care and judgment. It is probable that root-pruning is only salutary where there is an abundance of moisture in the soil. In times of drouth no practice can work greater injury. With corn, as with many other crops, deep culture should come before planting rather than after.. After cultivation should be more and more shallow as the corn increases in size.

RIDGE CULTURE.

This system of cultivation was tested again the past season but resulted in complete failure. This may be ascribed in part to a lack of experience in the use of the implements, and in part to the unprecedented drouth. The Station will give this system of cultivation another trial before pronouncing judgment upon it.

APPLICATION OF FERTILIZERS TO CORN.

The tests with fertilizers occupied the same forty plots that were devoted ot this purpose in 1883. These plots are ten and one-half feet wide, and contain one-sixteenth of an acre each. The soil is a clayey loam.

The fertilizers used were the following: 1. *Mineral;* nitrate of soda, muriate of potash, sulphate of ammonia, gypsum (land plaster), lime and wood ashes. 2. *Organic;* cow manure, horse manure, hog manure, hen manure, ground tobacco stems and bone meal. 3. *Partly mineral and partly organic;* South Carolina rock phosphate, and superphosphate of lime.

The above fertilizers were used separately, and in various combinations. The principal object in view was to ascertain the practical fertilizing value of potash, nitrogen and phosphoric acid for corn. For description and discussion of the various ingredients used, reference is made to the report of 1883.

It is thought by some that the science of chemistry should be able to determine the fertility of a soil, and indicate just what kind of fertilizers and the quantity of each that should be supplied in order to produce a maximum crop. This, chemistry is not yet prepared to do. It has taught us however, that every crop of hay or grain, fruit or vegetables, taken from a field, removes therefrom a certain quantity of mineral ingredients, such as lime, potash, phosphoric acid, and that the soil is thereby made poorer, until they are replaced. While chemistry can tell us little or nothing absolutely as to the productiveness of any given soil, it teaches us to foresee and prevent the exhaustion of the indispensable elements of fertility. Ammonia, nitric acid, potash, and phosphoric acid, are commercially the most valuable fertilizing ingredients. The two former furnish nitrogen which is one of the essential elements of plant food, and one that is frequently lacking.

Potash is the valuable fertilizing ingredient of wood ashes and "potash salts." It is soluble in water, and the cheapest form is that called muriate of potash.

Phosphoric acid is the characteristic ingredient of "superphosphates," and is produced by the action of the oil of vitriol on insoluble phosphates, such as is found in bone. Under the common name of "superphosphate" or "phosphates" are sold a large number of brands of fertilizers of different grades, varying in composition and value. The commercial value of a fertilizer depends, for the most part, upon the market value of the three substances, *nitrogen*, *potash* and *phosphoric acid*, together with expenses of manufacture. Its chemical valuation depends wholly upon the trade value of these three fertilizing ingredients.

It should be borne in mind that neither the commercial value nor chemical valuation is necessarily proportional to its fertilizing effects in any particular case. The Station, in its experiments with fertilizers on corn, is trying to practically answer the following questions: (1). What kind of fertilizing ingredients, and what proportion of each, does corn most need? (2). What quantity does it need? (3). What is the best manner of application?

All of the most common fertilizing substances have been employed. Much care has been exercised in applying them. They are tested on a soil and under climatic conditions fairly representing a large portion of the State. Thus far the results in the main are negative. If after another year's careful trial they subserve no good purpose, and the results are still negative, it may reasonably be concluded that mineral fertilizers are not needed where the soil and climate are like those of the Station's experiment grounds. At all events, continued, careful tests, with accurately observed and fully recorded results, cannot fail to give a mass of facts from which may be drawn deductions of signal value.

The kind and quantity of fertilizers applied to the different plots for the past two years are shown in the following tabulated statement.

FIRST SECTION.

No. of plot.	Treatment in 1883.	No. of plot.	Treatment in 1884.
1	Nitrate of Soda, 300 pounds per acre, in hill.	1	Nitrate of Soda, 300 pounds, in hill.
2	Same, 300 pounds, broadcast.	2	Same, 300 pounds, broadcast.
3	Same, 600 pounds, broadcast.	3	Left as last year.
4	Muriate of Potash, 300 pounds per acre, in hill.	4	Muriate of Potash, 300 pounds, in hill.
5	Same, 300 pounds, broadcast.	5	Same, 300 pounds, broadcast.
6	Same, 600 pounds, broadcast.	6	Left as last year.
7	South Carolina Rock Phosphate, 200 pounds, in hill.	7	South Carolina Rock Phosphate, 200 pounds in hill.
8	Same, 200 pounds, broadcast.	8	Same, 200 pounds, broadcast.
9	Same, 400 pounds, broadcast.	9	Same, 400 pounds, broadcast.
10	Unfertilized.	10	Unfertilized.
11	Sulphate of Ammonia, 200 pounds in hill.	11	Sulphate of Ammonia, 200 pounds in hill.
12	Same, 200 pounds, broadcast.	12	Same, 200 pounds, broadcast.
13	Same, 400 pounds, broadcast.	13	Same, 400 pounds, broadcast.
14	South Carolina Rock Phosphate, 200 pounds, broadcast. Nitrate of Soda, 300 pounds, broadcast.	14	South Carolina Rock Phosphate, 200 pounds, broadcast. Nitrate of Soda, 300 pounds, broadcast.
15	South Carolina Rock Phosphate, 200 pounds, broadcast. Muriate of Potash, 300 pounds, broadcast.	15	South Carolina Rock Phosphate, 200 pounds, broadcast. Muriate of Potash, 300 pounds, broadcast.
16	Muriate of Potash, 300 pounds, broadcast. Nitrate of Soda, 300 pounds, broadcast.	16	Muriate of Potash, 300 pounds, broadcast. Nitrate of Soda, 200 pounds, broadcast.
17	South Carolina Rock Phosphate, 200 pounds, broadcast. Sulphate of Ammonia, 200 pounds, broadcast.	17	South Carolina Rock Phosphate, 200 pounds, broadcast. Sulphate of Ammonia, 200 pounds, broadcast.
18	South Carolina Rock Phosphate, 200 pounds, broadcast. Sulphate of Ammonia, 200 pounds, broadcast. Muriate of Potash, 300 pounds, broadcast.	18	South Carolina Rock Phosphate, 200 pounds, broadcast. Sulphate of Ammonia, 200 pounds, broadcast. Muriate of Potash, 300 pounds, broadcast.
19	Unfertilized.	19	Unfertilized.
20	South Carolina Rock Phosphate, 200 pounds, broadcast. Sulphate of ammonia, 200 pounds, broadcast. Muriate of Potash, 300 pounds, broadcast. Nitrate of Soda, 300 pounds, broadcast.	20	Left as last year.

21	Same, one-half amount.	21	South Carolina Rock, 100 pounds, broadcast. Sulphate of Ammonia, 100 pounds, broadcast. Muriate of potash, 150 pounds, broadcast. Nitrate of Soda, 150 pounds, broadcast.
22	Same, one-third amount.	22	One-half of above.

SECOND SECTION—PARTLY ORGANIC AND PARTLY MINERAL FERTILIZERS.

23	Special corn manure, 300 pounds, in hill	23	Special corn manure, 300 pounds in hill.
24	Same, 300 pounds, broadcast.	24	Same, 300 pounds, broadcast.
25	Same, 600 pounds, broadcast.	25	Same, 600 pounds, broadcast.
26	Unfertilized.	26	Unfertilized.
27	Gypsum, 500 pounds, in hill.	27	Gypsum, 500 pounds, in hill.
28	Same, 500 pounds, broadcast.	28	Same, 500 pounds, broadcast.
29	Same, 1,000 pounds, broadcast.	29	Same, 1,000 pounds, broadcast.
30	Lime, 50 bushels, in hill.	30	Agricultural salt, 500 pounds, broadcast.
31	Same, 50 bushels, broadcast.	31	Left as last year.
32	Wood ashes, 40 bushels, in hill.	32	Wood ashes, 40 bushels, in hill.
33	Same, 40 bushels, broadcast.	33	Same, 40 bushels, broadcast.

THIRD SECTION—ORGANIC MANURES.

34	Cow manure, 16 tons, broadcast.	34	Cow manure, 16 tons, broadcast.
35	Horse manure, 16 tons, broadcast.	35	Horse manure, 16 tons, broadcast.
36	Hog manure, 16 tons, broadcast.	36	Hog manure, 16 tons, broadcast.
37	Hen manure, 4 tons, broadcast.	37	Hen manure, 2 tons, broadcast.
38	Ground tobacco stems, 400 pounds, in hill.	38	Ground tobacco stems, 400 pounds, broadcast.
39	Bone meal, 400 pounds, in hill.	39	Bone meal, 400 pounds, broadcast.
40	Unfertilized.	40	Unfertilized.

The following table shows the yield of sound and soft corn, and stalks, for the different plots. The yields are the estimates of one acre. For particulars regarding the amounts and method of application of the different fertilizers, reference is made to the preceding diagram. The corrected yield is not given for the stand was nearly perfect, the per cent. of plants missing being small, and nearly equal in the different plots.

A few exceptions to this general statement should be noted. Where nitrate of soda, muriate of potash, wood ashes, and special corn manure were used in the hill, the stand was injured considerably. If the correction was applied to these plots, the yields would be nearly up to the average. The injury was greatest with muriate of potash and least with the special manure.

These ingredients were thoroughly incorporated with the soil, but despite this care they had an injurious effect upon the germination and vegetation of the seed.

It is worthy of note that hen manure, at the rate of four tons per acre, as used in 1883, injured the stand seriously, while an application of two tons on the same plots this year did not materially lessen the stand.

YIELDS OF CORN AND STALKS OF THE THREE SECTIONS.

Number of plot.	Fertilizer used.	Bushels sound corn.	Bushels soft corn.	Total bushels corn.	Weight of stalks—pounds.	Weight of stalks to 100 pounds corn—pounds.
	FIRST SECTION.					
1	Nitrate of Soda......	21.9	1.8	23.7	1,248	75
2	" "	28.2	0.9	29.1	1,600	77
3	Unfertilized	28.3	0.7	28.9	1,568	80
4	Muriate of Potash..................	19.6	1.8	20.4	1,492	90
5	" "	29.5	1.4	30.9	1,664	77
6	Unfertilized	25.8	2.3	28.1	1,760	90
7	S. Carolina Rock Phosphate..	22.9	1.4	24.3	1,504	89
8	" " ..	19.4	2.0	21.4	1,568	104
9	" " ..	24.0	2.0	26.0	1,504	82
10	Unfertilized	26.3	1.8	28.1	1,968	79
11	Sulphate of Ammonia	18.7	2.7	21.4	1,408	93
12	" "	30.4	3.0	33.4	1,696	72
13	" "	21.5	3.2	24.7	1,376	80
14	Mixtures of above...............	29.7	2.6	32.3	1,504	70
15	" "	35.1	4.3	39.4	1,760	64
16	" "	34.4	1.4	35.8	1,856	74
17	" "	32.2	1.5	33.7	1,600	67
18	" "	34.3	0.8	35.1	1,568	63
19	Unfertilized	43.2	0.5	43.7	1,824	59
20	"	42.7	0.2	42.9	1,664	55
21	Mixtures of above	56.7	0.0	56.7	2,304	60
22	" "	54.3	0.0	54.3	2,080	55

Number of plot.	Fertilizer used.	Bushels sound corn.	Bushels soft corn.	Total bushels corn.	Weight of stalks—pounds.	Weight of stalks to 100 pounds corn—pounds.
	SECOND SECTION.					
23	Special corn manure	53.5	0.0	53.5	2,240	58
24	“ “	55.3	0.0	55.3	2,080	55
25	“ “	60.1	0.0	60.1	2,464	56
26	Unfertilized	53.9	0.5	54.4	1,984	50
27	Gypsum	54.9	0.0	54.9	2,044	51
28	“	51.0	0.7	51.7	1,984	55
29	“	43.2	1.3	44.5	1,824	58
30	Agricultural Salt	40.7	1.6	42.3	1,600	57
31	Unfertilized	42.7	1.6	44.3	2,044	69
32	Wood ashes	32.7	0.2	32.9	1,504	65
33	“	39.6	0.0	39.6	1,984	71
	THIRD SECTION.					
34	Cow manure	32.2	1.6	33.8	1,664	70
35	Horse manure	42.5	0.2	42.7	1,824	61
36	Hog manure	48.2	0.2	48.4	2,016	59
37	Hen manure	52.3	0.5	52.8	2,272	61
38	Tobacco stems	51.4	0.2	51.6	2,144	60
39	Bone meal	49.8	0.5	50.3	1,984	56
40	Unfertilized	52.8	0.2	53.0	2,304	62

The special corn manure is manufactured by H. J. Baker & Bro., New York. It cost fifty dollars per ton and has a guaranteed analysis of nitrogen 4.12 per cent; available phosphoric acid, 6.25 per cent.; potash, 7.00 per cent.

The "fertilizing salt" is a refuse product of salt works, and was furnished the Station by E. S. Fitch, of Bay City, Mich.

REPORT OF THE SUPERINTENDENT OF FIELD EXPERIMEN

EXPERIMENTS WITH POTATOES.

The attention of the Station in these tests has been directed towards following ends, viz: Testing varieties, originating varieties, methods culture, and application of fertilizers.

The work in the main has been conducted on the general plan as set fo in previous reports, but has been enlarged as to its scope and the attentio has received. Each division will be treated separately.

TEST OF VARIETIES.

The ground was put in excellent shape for this work by thoroughly manur and working the soil until it appeared as fine and even as a garden bed.

The plot or plots occupied a long strip of earth, just sixteen feet wide, ea variety occupying one row. The rows were laid off three feet apart, the ea removed to a depth of four inches, and on the bottom of this trench the pie were laid one foot apart, beginning six inches from either end, and the tre filled to the surface. This gave sixteen hills of each variety. After plant the ground was raked level.

The seed was cut to two eye pieces, and all cut as near the sa size as possible, the seed end in no case being used. This care taken to give all an equal and the best possible chance to produce a go crop, but the severe drought, which is elsewhere spoken of, cut the yield sh yet apparently in nowise injured the comparison. So far as could be noti all plots had an equal chance, and grew with about the same vigor.

The list of varieties tested is quite long, and embraces all of the newer so which we could conveniently obtain, and many sorts which have been out years and are well known. The object of keeping the older sorts in the will be obvious to all.

With potatoes, as with many other garden vegetables, the list of varie has become so inflated as to baffle all attempts at accurate description. T only remedy for this is to group the several varieties resembling each ot into a class and give them one general description. This has been begun, the comparisons are not yet sufficiently accurate for publication.

The following table gives the general results of the test of varieties.

TABLE I.

No. of plot.	Variety.	Weight of seed planted.		Condition of seed planted.	Weight of crop harvested.		Estimated yield per acre; total bush.	Marketable, bush.	Small, bushels.	Date of ripening.
		lbs.	*oz.*		*lbs.*	*oz.*				
1	Beauty of Hebron	1	0	Soft, badly sprouted	10	4	155.0	132.0	22.7	July 23
2	Belle	1	0	Fine, solid	6	8	98.8	75.6	22.7	Aug. 11
3	Boston Market	0	14	Fine, solid	10	8	158.8	132.3	26.5	8
4	Burbank	1	0	Fine, solid	10	0	151.2	136.1	15.1	11
5	Clark's No. 1	1	5	Rough, soft	10	8	158.8	105.9	52.9	July 18
6	Champion of America	1	8	Large and fine	9	8	143.7	128.6	15.1	Aug. 2
7	Cook's Superb	1	0	Fair, little soft	10	8	158.8	136.1	22.7	11
8	Dakota Red	1	0	Very fine, solid	10	8	158.8	143.7	15.1	16
9	Dunmore	1	5	Large, rough and soft	9	0	136.1	121.0	15.1	2
10	Early Gem	...	...	Fair	6	4	94.5	71.8	22.7	July 23
11	Early Harvest	0	15	Fair, smooth and solid	6	12	102.1	79.4	22.7	18
12	Early Ohio	0	14	Soft, spongy	6	0	90.7	75.6	15.1	18
13	Early Rose	...	...	Large and fine	7	8	113.4	90.7	22.7	Aug. 2
14	Electric	0	15	Fine seed	7	4	109.6	98.3	11.3	2
15	Garfield	0	10	Small and solid	6	12	102.1	87.0	15.1	24
16	Seedling	0	8	Small and soft	4	4	64.3	56.7	7.6	2
17	Hall's Early Peachblow	0	13	Small, fine seed	5	8	83.2	79.4	3.8	11
18	Iroquois	0	15	Small and soft	4	8	68.0	52.9	15.1	8
19	Jas. Vick	1	2	Solid, fine seed	10	8	158.8	143.7	15.1	27
20	Jones' Prize Taker	0	13	Medium and solid	6	12	102.1	98.3	3.8	8
21	Jumbo	1	8	Soft, poor seed, very large	12	4	185.3	166.4	18.9	11
22	Late Ohio	1	0	Fair, solid seed	10	4	155.1	147.5	7.6	8
23	La Plume Triumph	1	3	Soft and rough	11	0	166.4	143.7	22.7	21
24	Lee's Favorite	1	0	Medium, fair seed	8	4	124.7	113.4	11.3	2
25	Mammoth Pearl	1	7	Fine, solid seed	10	0	151.2	139.9	11.3	11
26	Mayflower	1	2	Medium, poor, and soft	6	0	90.8	68.1	22.7	2
27	Seedling	1	6	Fine, solid seed	5	12	86.9	73.7	13.2	Sept. 15

TABLE I.—Continued.

No. of plot.	Variety.	Weight of seed planted.		Condition of seed planted.	Weight of crop harvested.		Estimated yield per acre; total bush.	Marketable, bush.	Small, bushels.	Date of ripening.
		lbs.	*oz.*		*lbs.*	*oz.*				
28	*Nott's Victor	0	5	Only one potato, eleven pieces	7	8	113.4	102.1	11.3	Aug. 2
29	O. K. Mammoth Prolific	...	...	Fine, solid seed	10	0	151.2	143.7	7.5	18
30	Parson's Prolific	0	14	Fine, solid seed	10	0	151.2	139.9	11.3	18
31	Pearl of Savoy	1	0	Very fine seed	7	8	113.4	98.3	15.1	July 23
32	Queen of Valley	...	...	Large, fine seed	10	8	158.8	151.2	7 6	Aug. 18
33	Red Elephant	1	7	Fair seed	8	8	128.6	121.0	7.6	27
34	Rochester Favorite	1	0	Fair seed	9	0	136.1	128.5	7.6	27
35	Rural Blush	1	1	Medium, fair seed	14	0	211.7	196 6	15.1	27
36	Snowflake	1	1	Medium, fair seed	10	0	151.2	117.2	34.0	2
37	State of Maine	1	7	Large, solid	9	12	147.5	139.9	7.6	15
38	St Patrick	0	8	Small, solid	8	0	121.0	109.7	11.3	15
39	Telephone	0	15	Medium, very poor	6	12	102.1	79.4	22.7	2
40	Tremont	0	14	Soft, poor seed	7	4	109.6	90.7	18.9	8
41	Vanguard	1	2	Very soft and poor	5	12	86 9	75.6	11.3	July 23
42	Vermont Champion	0	13	Medium, soft	10	0	151.2	136.1	15.1	Aug. 8
43	Vick's Extra	0	9	Medium, fair	5	0	75.6	45.4	30.2	2
44	Vick's Improved Peachblow	1	0	Medium, solid	10	8	158.8	136.1	22.7	8
45	Vick's Prize	1	0	Medium, solid	9	4	139.9	132.3	7.6	18
46	Wall's Orange	0	13	Medium, solid	10	0	151.2	121.0	30.2	27
47	White Star	1	0	Medium, solid	8	0	121.0	98.3	22.7	27
48	White Elephant	1	2	Medium, solid	7	8	113.4	98.3	15.1	27
49	†New O. K	0	7	Medium, solid	5	8	83.2	75.6	7.6	27
50	†Early Sunrise	0	6	Medium, solid	4	8	68.1	64.3	3.8	8

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* This was one potato sent the Station by a gentleman in Vermont. Its yield, corrected to perfect stand, *i. e.*, 16 hills, is 151.2 bushels.

† These were planted May 10, and were more affected by the drought than others.

These varieties were all planted May 3d, with the exceptions noted, and were marked ripe just when the foliage was all dead. They were dug in the latter part of August and early in September, varying with the time of ripening. All were sorted and weighed in the field. The quantity of seed planted, the condition of seed when planted, and the amount of crop actually harvested are given as data of interest to those who wish to give the matter a careful study. Then follow in the table total estimated yield per acre, yield of marketable and small tubers, and time of ripening.

The following table gives in a condensed form the main points in our study of varieties this year. The stand of all plots was nearly perfect, and no corrected yield is given.

TABLE II.

No. of plot.	Variety.	Per cent. of large tubers.	Per cent. of small tubers.	Weight of six largest tubers.		Height of vine.	General characteristics of tuber, as to shape, color, etc.	Quality, rated 0 to 10.
				Lbs.	*Oz.*	*In.*		
1	Beauty of Hebron	60	40	1	9	12	Long, light, smooth	8
2	Belle	50	50	1	1	18	Round, flattened, color varies, eyes deep	6
3	Boston Market	56	44	1	6	20	Longer than thick, light color, smooth	8
4	Burbank	80	20	1	1	24	Long, very smooth, light skin	8
5	Clark's No. 1	34	66	1	8	13	Rather long, sometimes round, eyes medium depth, light color.	8
6	Champion of America	50	50	1	10	23	Rather long and flattish, uneven, light color	5
7	Cook's Superb	52	48	1	9	20	Round, flattened, uneven, light color	7
8	Dakota Red	64	36	2	9	24	Slightly longer than thick, flattened, uneven, dark rose color.	8
9	Dunmore	48	52	1	7	14	Round, flattened, smooth, light color	
10	Early Gem	45	55	1	5	12	Longer than thick, slightly flattened, light color	7
11	Early Harvest	52	48	1	1	11	Long, smooth, light color	8
12	Early Ohio	66	33	1	7	10	Little longer than thick, very uniform shape, light rose color.	8
13	Early Rose	53	47	0	15	14	Long, somewhat flattened, smooth, light rose color	8
14	Electric	65	35	1	9	15	Rather long, round, eyes medium, pink rose tint	
15	Garfield	61	39	1	2	19	Round, skin russet, light color, eyes not deep	
16	Seedling	85	15	1	4	13	Long, smooth, few eyes, brown with rose tint	
17	Hall's Early Peachblow	75	25	1	12	21	Resembles somewhat the old Peachblow, eyes deep and rose color, other parts light	7
18	Iroquois	48	52	1	2	16	Round, smooth, light color	6
19	Jas. Vick	64	36	1	11	24	Long, round, eyes medium depth, light color	
20	Jones' Prize Taker	79	21	2	2	20	Round, irregular, skin rough, eyes medium depth, light	
21	Jumbo	56	44	2	5	23	Round, very irregular, russet skin, light color	4
22	Late Ohio	77	23	2	11	25	Very similar in appearance to Early Ohio, darker	8
23	La Plume Triumph	59	41	2	3	17	Long, irregular, light color	
24	Lee's Favorite	66	34	1	5	13	Rather long and flattish, smooth, light color	8
25	Mammoth Pearl	74	26	1	7	21	Round, somewhat irregular, eyes medium, skin russet, light colored	8
26	Mayflower	51	49	1	0	12	Rather long and irregular, smooth, light colored	

27	Seedling	40	60			25	Round, flattened, irregular, light color	5
28	Nott's Victor	66	34	1	13	16	Round, regular, smooth, light colored	8
29	O. K. Mammoth Prolific	75	25	2	1	23	Very much resembles Mammoth Pearl	
30	Parson's Prolific	64	36	1	13	20	Very similar to above, regular in shape	6
31	Pearl of Savoy	62	38	1	4	12	Longer than thick, smooth, regular, pinkish color	8
32	Queen of the Valley	78	22	2	13	22	Long, irregular, slightly rough, light color	6
33	Red Elephant	85	15	2	1	25	Long, rather uneven, color variable	6
34	Rochester Favorite	71	29	2	6	24	Rather long, nubby, fairly smooth, light and russet	
35	Rural Blush	68	32	2	7	24	Round and flattish, and little irregular, russety, light color	7
36	Snowflake	46	54	1	10	16	Longer than thick, smooth, uniform, light color	9
37	State of Maine	82	18	1	15	20	Round, even, skin light	8
38	St. Patrick	62	38	1	12	19	Rather long and uneven, russet, light color	
39	Telephone	52	48	1	7	11	Round, smooth, light color	7
40	Tremont	51	49	1	9	23	Round and flattish, smooth, light color	
41	Vanguard	53	47	1	5	10	Slightly longer than round, smooth, light color	6
42	Vermont Champion	68	32	1	10	15	Round, full, smooth, russet, light	7
43	Vick's Extra	33	67	0	13	13	Round, smooth, light color	
44	Vick's Improved Peachblow	62	38	1	2	20	Resembles old Peachblow	6
45	Vick's Prize	64	36	1	14	17	Longer than thick, fairly smooth, light color	6
46	Wall's Orange	53	47	1	8	21	Round, uneven, light color	
47	White Star	50	50	1	9	21	Very much resembles Burbank	8
48	White Elephant	52	48	1	9	22	Quite uneven, similar in other respects to above	8
49	New O. K	68	32	1	4	19	Long, uniform, light color	
50	Early Sunrise	74	26	1	7	18		

Table II sets forth quite as accurately as possible the results of our examination of these varieties the past season. These figures and notes will necessarily vary somewhat with soil and conditions yet for this year we feel that it is a pretty fair exposition of the varieties tested.

The notes on general characteristics of the tuber, etc., are very indefinite, yet from the nature of this plant and its great tendency to vary they could not be otherwise. The column on quality is given from our notes as they were tested on the table, 0 means worthless and 10 perfection. Some are not graded from the fact that part of these notes were misplaced and could not be found.

We do not wish to especially commend any variety, but call attention to the following points of the tables: Earliest to ripen, Clark's No. 1, Early Harvest and Early Ohio, time 75 days; of these the first shows heaviest yield and the last best development of tubers, all are marked 8 in quality. Second early are Beauty of Hebron, Early Gem, Pearl of Savoy and Vanguard, of these the first has, all things considered, much the best record. Of those ripening August 18 to 27, Rural Blush holds decidedly first place in yield and shows good development of tuber. The lastest to ripen was No. 27, a seedling of which we spoke in favorable terms last year, but this year it was almost a total failure. It grew very rank and seemed to stand the drouth, but formed very few tubers.

Special mention cannot be made of all important points.

This list embraces many varieties, the excellence of which was published far and wide in the seedsmen's advertisements, but of all the newer sorts tested we could not reccommend one over some of the older and well-known varieties.

Objections may be raised to the size of plots, but we offer the following points in defence of using small plots: 1st, The soil of small plots can be made much more uniform than larger ones. 2d, Work of preparing rows, planting, etc., must all be done by hand and guaged by tape line and rule. This would be a task of no small dimensions, and without a large force could not be done in proper season. 3d, The note taking, examinations, etc., can be made more accurately on small plots.

Wherever work can be performed with horses or in any rapid manner, large plots are preferable.

The subject of originating new varieties naturally comes in connection with the testing of varieties and will be treated of very briefly in this connection.

The tuber is not the true seed of the potato, but simply an enlarged portion of an underground stem. This stem usually branches off from the stalk above the roots and pushes its way into the loose soil, forming the tuber usually at the end but frequently two or more are borne on the same stem.

The tuber bears upon its surface a greater or less number of buds (eyes), which are the terminii of branches. The ordinary method of propagating the potato is to plant the tuber either whole or cut into divisions. This amounts to propagating by cutting and is not by seed. After being indefinetely propagated in this manner ether through poor selection of tubers or through a constitutional weakness which may be the result of some fungoid disease, the stock loses vitality, hence a deteriorated product. This doubtless is the true secret of the "running out" of varieties. That varieties do deteriorate or "runout" there can be no doubt for every few years old favorite varieties give way to newer ones of greater vigor and these in turn are succeeded by others. We wish to enter into no discussion of the merits of selecting sound seed, etc., at this time but simply point out these facts as pointing to the necessity of originating new varieties. This is done by planting the seed balls which form on the vines. It is a matter of some difficulty and requires considerable care and judgment to be made successful

In the first place to get good seed is quite difficult without sending to those who make a specialty of growing it, our ordinary varieties seldom ever developing seed.

This failure to develop seed is doubtless due to the plants being surrounded by unnatural conditions. The seed should be treated very much as tomato seed is, and the plants placed in a well prepared bed about the same time that tomato plants would be set out.

The product of each plant may be of various shapes and colors; these should be carefully sorted and planted the second year. From this second crop can be sorted those of greatest promise, several seasons being required to select and establish a variety.

The Station has a large number of seedings of which the public will hear more in a few years.

METHODS OF CULTURE.

This work includes selecting seed, cutting, planting, etc. It and the work in fertilizers occupied a piece of black loamy soil previously cultivated in onions, and of about average fertility.

The ground was very thoroughly prepared and all of the planting was in rows three feet apart, twelve inches between the hills, and covered four inches deep, in furrows, unless otherwise specified.

The seed was fine medium sized tubers, no small ones or seed ends being used unless so stated The general plan of the work was the same as for previous years, and this work, especially the cutting of seed, was quite fully discussed in last report.

The following table exhibits this work in detail:

TABLE III.

Number of plot.	Variety.	How treated.	Bushels of large potatoes.	Bushels of small potatoes.	Total bushels per acre.	Per cent. of large by count.	Per cent. of small by count.	Date of ripening.
1	Burbank	Straw mulch	101.1	7.6	108.7	75	25	Sept. 10
2	Snowflakes	"	109.7	19.9	129.6	53	47	Aug. 21
3	Burbank	Ordinary	74.7	5.7	80.4	67	33	Sept. 10
4	Snowflakes	"	51.0	7.6	58.6	63	37	Aug. 21
5	Burbank	Large whole seed	158.8	13.2	172.0	75	25	Sept. 10
6	Snowflakes	" "	143.7	20.3	164.0	66	34	Aug. 21
7	Burbank	Small "	134.2	6.1	140.3	79	21	Sept. 10
8	Snowflakes	" "	127.7	6.6	134.3	80	20	Aug. 21
9	Burbank	Large cut once lengthwise	144.6	11.3	155.9	66	34	Sept. 10
10	Snowflakes	" "	80.8	18.4	99.2	61	39	Aug. 21
11	Burbank	Stem end	117.2	11.3	128.5	62	38	Sept. 15
12	"	Seed end	124.3	16.3	140.6	62	38	" 15
13	"	Cut to one eye	87.4	3.8	91.2	77	23	" 13
14	Snowflakes	" "	39 0	7.6	46.6	43	57	" 2
15	Burbank	Ordinary	70.9	0 0	70.9	97	3	" 10
16	Snowflakes	"	73.7	9.9	83.6	65	35	Aug. 27
17	Burbank	Cut to one eye	79.4	3.3	82.7	79	21	Sept. 12
18	Snowflakes	" "	85.0	3.8	88.8	78	22	" 2
19	Burbank	Reversed one eye	49.2	4.0	53.2	67	33	" 15
20	"	Cut to one eye, planted 3 feet by 9 inches	54.8	5.0	59.8	73	27	" 19
21	"	" " " 6 inches	50.1	5.7	55.8	72	28	" 15
22	"	Ordinary	91.2	4.5	95.7	73	27	" 15

26	"	Cut ordinary, 2 feet by 1 foot.	140.1	8.5	154.6	73	27	"	10
27	"	" " 9 inches	137.9	12.8	150.7	70	30	"	10
28	"	" " 6 inches	163.1	8.5	171.6	76	24	"	10
29	"	Whole seed trimmed during growth	101.1	18.0	119.1	59	41	"	10
30	"	Ordinary cut trimmed during growth	52.9	4.8	57.7	75	25	"	15
31	"	Ridge culture	64.3	3.8	68.1	71	29	"	19
32	"	Flat "	66.5	2.1	68.6	80	20	"	19
33	"	Ridge "	96.4	2.6	99.0	82	18	"	19
34	"	Flat "	103.5	7.8	111.3	70	30	"	19
35	"	Ridge "	99.3	4.7	104.0	70	30	"	19
36	"	4 inches deep	89.7	9.0	98.7	60	40	"	19
37	"	6 "	68.3	4.3	72.6	67	33	"	8
38	"	8 "	74.3	3.5	77.8	74	26	"	8

This work was all planted May 13th; plots same length as varietie two rows wide.

The conditions at planting were of the most favorable, but these plo fered even more severely from the drouth than varieties.

The results with whole seed, and the different cuttings bear out the conclusions as previous years. The whole seed and the large cuttings yields in every instance superior to small cuttings.

The best yield is shown at plot 5, "Burbanks large whole;" the second is at plot 28, "Burbanks cut ordinary, 2 feet by 6 inches."

This latter plot is considered very close planting. It shows a good de ment of tubers, and a very good yield under the circumstances.

In every case "ordinary cutting" means two eyes, and "ordinary plan 3x1 ft.

Plots 3 to 19, inclusive, give a very complete exposition of the di metho s of preparing the seed, and need little comment. Of these, plo 17 and 18 show very good results for the one eye cutting, and slightly s the ordinary cuts, as shown in plots 15 and 16. Plot 19 "reversed" "one eye cutting," simply beginning at the seed end. This shows a con ably reduced yield over those previously mentioned, which cannot w accounted for.

The method of cutting tubers to one eye has been frequently descri agricultural journals, and was described in the previous report of this S This cutting has failed in every instance with us to produce yields eq whole and large cut seed. In favor of it can be said that much less s required to plant an acre by this method, the difference being 1 to 4 or that with favorable condition of soil and climate, it will admit of close ing, and doubtless produce good results.

The climatic conditions here have been against the use of small se there can be no doubt of large cutting and whole seed being more able to stand a drouth than small cutting. The amount of seed required to pla acre with whole seed and large cutting is against their use and becomes serious consideration when seed is dear. Yet, with a good market f crop, this may be entirely offset by the increased yield, and the time of ing is in favor of this method.

Plots 20 to 28, inclusive, are intended to illustrate the planting at di distances of "ordinary" and "one eye" cut seed. The distance is from full width planting to very close, two feet by six inches. The yie these plots and also the development of tubers are decidedly in favor of ary cut seed.

In all of this work the small cuttings were covered but two or three i deep.

Plots 29 to 38 complete the list of plots in methods of culture. In this list is found an experiment in ridge and flat culture, also depth of planting. These seem to indicate that flat culture is superior to ridge, and that four inches deep is better than greater depths.

This work will receive more attention the coming year, when it is hoped the climatic conditions will be more favorable.

All of the general experiment work is flat culture.

In conclusion we would say that the cutting of seed is a matter of great importance and demands careful attention. One eye seed requires six to eight bushels to plant an acre, whole seed twenty to thirty five bushels. The price of seed, the probable value of the crop, the conditions of soil, the probable conditions of climate, the variety used, are all important factors which should enter into consideration. Some of these can not be determined with accuracy beforehand, yet all can be weighed and to a certain extent given their place in the problem. The table presents matter for much more careful study than our space will permit.

The corrected yield for these plots is not given, as the stand was very near perfect.

The following table presents the results obtained from whole seed and one eye cutting for three years at the Station :

TABLE IV.

Year.	Seed.	Bushels large tubers.	Bushels small tubers.	Total bushels.
1882	Whole			301.5
1882	One eye			164.0
1883	Whole	241.8	21.9	263.7
1883	One eye	127.2	7.9	135.1
1884	Whole	158.8	13.2	172.0
1884	One eye	87.4	3.8	91.2

This is given for but one variety, Burbank.

APPLICATION OF FERTILIZERS.

This work occupied sixty-four plots of the same size and contiguous to methods of culture. Two varieties were used throughout the work, the plots being planted in sets of two each, both varieties thereby receiving the same treatment. The varieties were Burbanks and Seedling, which latter we have

previously stated was almost an entire failure. It is omitted from the r
leaving thirty-two plots of the fertilizer work.

These were all planted May 13 in trenches four inches deep, rows thre
apart and twelve inches in the row. The seed was all cut two eyes t
piece. The pieces were covered about two inches deep, then the fer
spread evenly on the row and the trench filled level with the surface.
were given flat and very thorough culture. The table presents the ge
results.

TABLE V.

No. of plot.	How treated.	Bushels of large tubers.	Bushels of small tubers.	Total bushels.	Per cent. of large.	Per cent. of small.	Average size.
1	Compost, 10 tons per acre	95.5	9.5	105.0	75	25	Below medium.
2	“ 5 “	79.4	8.0	87.4	54	46	“
3	Special manure, 800 pounds per acre	51.5	15.1	66.6	47	53	“
4	“ 600 “ “	107.3	12.3	119.6	62	38	Above medium.
5	“ 400 “ “	105.9	6.6	112.5	77	23	Medium.
6	Unfertilized	93.1	10.9	104.0	63	37	“
7	Lime, 50 bushels per acre	68.5	6.6	75.1	68	32	“
8	“ 25 “ “	73.3	6.6	79.9	64	36	“
9	Tobacco stems, 800 pounds per acre	90.8	11.3	102.1	52	48	Above medium.
10	“ 400 “ “	77.5	9.5	87.0	55	45	“
11	Unfertilized	68.1	5.7	73.8	69	31	“
12	Tobacco stems, 200 pounds per acre	90.8	9.0	99.8	73	27	“
13	Wood ashes, 100 bushels per acre	93.6	6.6	100.2	80	20	“
14	“ 50 “ “	105.9	9.5	115.4	75	25	“
15	“ 25 “ “	96.9	10.4	107.3	71	29	“
16	Unfertilized	91.7	6.6	98.3	80	20	“
17	Coal ashes, 20 tons per acree	102.6	5.7	108.3	80	20	“
18	“ 10 “ “	116.3	5.7	122.0	80	20	“
19	Compost, 20 tons per acre	113.9	11.3	125.2	68	32	“
20	Unfertilized	92.6	17.0	109.6	57	43	Medium.
21	Muriate of potash, 800 pounds per acre	87.9	10.4	98.3	66	34	Above medium.
22	“ 400 “ “	115.8	6.6	122.4	68	32	“
23	“ 200 “ “	95.5	11.8	107.3	63	37	“
24	Unfertilized	110.6	13.2	123.8	68	32	“
25	Salt, 200 pounds per acre	68.1	18.9	87.0	44	56	Medium.

TABLE V.—Continued.

No. of plot.	How treated.	Bushels of large tubers.	Bushels of small tubers.	Total bushels.	Per cent. of large.	Per cent. of small.	Average size.
26	Unfertilized	115.3	7.6	122.9	75	25	Above medium.
27	Hen manure, 5 tons per acre	120.5	6.1	126.6	70	30	"
28	" 2 " "	140 9	13.2	154.1	65	35	"
29	Unfertilized	101.6	8.5	110.1	67	33	"
30	Bone meal, 800 pounds per acre	94.5	6.6	101.1	83	17	"
31	" 600 " "	61.4	12.3	73.7	59	41	"
32	" 400 " "	104.0	10.9	114.9	63	57	"

The time of ripening of the above plots was quite uniform, being about September 10. Two exceptions may be noted to this, in case of treatment with hen manure and tobacco stems. These plots seemed to ripen a little later.

The fertilizers include a large number of common substances used for their manurial value, and need no special description. The special manure used was prepared by H. J. Baker & Bro., New York City, as a potato manure. The compost was barnyard manure rotted with muck.

By taking an average of the unfertilized plots, we get 106 bushels per acre as the probable productiveness of the soil. Then, taking this as the basis of a calculation, we have the following summary, which aids very much in getting at the salient points of the previous table:

TABLE VI.

No. of plots treated.	How treated.	Average yield per acre—bushels.	Increase or decrease over standard plot, + or —.	Greatest yield obtained from each treatment.
7	Unfertilized	106.0		123.8
3	Compost	105.8	— .2	125.2
3	Special manure	99.5	— 6.5	119.6
2	Lime	77.5	—28.5	79.9
3	Tobacco stems	96.3	— 9.7	102.1
3	Wood ashes	107.6	+ 1.6	115.4
2	Coal ashes	115.1	+ 9.1	122.0
3	Muriate of potash	109.3	+ 3.3	122.4
1	Salt	87.0	—19.0	87.0
2	Hen manure	140.3	+34.3	154.1
3	Bone meal	96.5	— 9.5	114.9

Whether we are justified in taking the average of unfertilized plots as the standard of productiveness, may be questioned, but it seems to be as reliable as any of the other yields, and is the average of more than twice as many plots as the other averages are taken from. But if we do allow this plot to represent the productiveness of the soil, we must say that our fertilizers were in the majority of cases injurious, rather than beneficial. Whatever influence the severe drought had in bringing about this result, we are unable to say.

Corrected yields are not given, as only three of the plots failed to make a perfect stand, and there the correction would have been slight. It is worthy of note, however, that these three plots were Nos. 7, 13, and 21, where fertilizers were doubtless used in excessive quantities.

We give for comparison the three best plots from fertilizer work of 1883 and 1884:

TABLE VII.

Year.	How treated.	Bushels large tubers.	Bushels small tubers.	Total bushels.
1883	Hen manure, 500 pounds per acre	223.0	17.2	240.2
1883	Coal ashes 20 tons per acre	239.0	13.4	252.4
1883	Compost, 16 tons per acre	211.3	26.7	238.0
1884	Hen manure, 2 tons per acre	140.9	13.2	154.1
1884	Compost, 20 tons per acre	113.9	11.3	125.2
1884	Coal ashes, 10 tons per acre	116.3	5.7	122.0

EXPERIMENTS IN PIG FEEDING.

Last year the Station gave the results of an experiment to show the comparative effect of shelter and exposure in the flesh production of fattening pigs, together with the amount of corn required to produce a given weight of pork under these different conditions. Since then an experiment has been conducted to test the comparative rapidity of growth of two well known breeds of pigs when treated alike, and to show the value of roots when fed in connection with corn.

September 17, 1884, six thoroughbred Berkshire pigs were divided into two lots of three each, put in separate pens, fed corn in the ear twice daily, and given an abundant supply of fresh water.

At the same date four thoroughbred Poland China pigs of the same age were divided into two lots of two each, and treated in precisely the same manner.

September 27, after the pigs had become thoroughly accustomed to their new quarters, and were all in a fine, thrifty condition, each lot was weighed, with the following results:

Pen No. 1, three Berkshires, weight 420 pounds.
Pen No. 2, two Poland China, weight 286 pounds.
Pen No. 3, three Berkshires, weight 412 pounds.
Pen No. 4, two Poland China, weight 290 pounds.

These pigs were all sows, of about equal size and weight. They were kept in open pens. Each pen had a tight floor, and one-half of each was roofed over with boards to protect the pigs from rain. A good bedding of straw was provided. The temperature was that of the out door atmosphere.

The pigs in pens Nos. 3 and 4 were fed nothtng but corn in the ear. They were fed twice daily, great care being taken to give them just the amount they would eat. Pure water was kept before them at all times.

The pigs in pens Nos. 1 and 2 were treated in precisely the same manner, except receiving all the roots they would eat in addition to the corn.

It was the intention to feed carrots for a period of four weeks, beets (sugar) for four weeks, and potatoes for four weeks.

It was found, however, that after feeding carrots the specified time the pigs could not be induced to eat beets, so the carrots were continued. The last period of four weeks, carrots and potatoes were fed in equal proportions.

The temperatures recorded are averages for each week, found by takin mean of three daily observations as the average for each day.

Table I gives the results of the experiment in detail.

TABLE I.

Number of Pen.	Corn eaten—pounds.	Roots eaten—pounds.	Weight at beginning of week—pounds.	Weight at end of week—pounds.	Gain for week—pounds.	Average temperature for
First Week—September 27th to October 4th.						
Pen 1	177	41	420	448	28	
" 2	118	16	286	300	14	
" 3	193	....	412	440	28	
" 4	109	....	290	310	20	
Second Week—October 4th to October 11th.						
Pen 1	219	42	448	486	38	
" 2	136	29	300	330	30	
" 3	210	....	440	464	24	
" 4	124	....	310	328	18	
Third Week—October 11th to October 18th.						
Pen 1	230	33	486	524	38	5
" 2	121	30	330	344	14	
" 3	191	....	464	498	34	
" 4	98	....	328	327	—1	
Fourth Week—October 18th to October 25th.						
Pen 1	206	83	524	552	28	4
" 2	95	38	344	350	6	
" 3	209	....	498	534	36	
" 4	102	....	327	356	29	

TABLE I.—Continued.

Number of pen.	Corn eaten—pounds.	Roots eaten—pounds.	Weight at beginning of week—pounds.	Weight at end of week—pounds.	Gain for week—pounds.	Average temperature for each week—Degrees, Fahr.
FIFTH WEEK—October 25th to November 1st.						
Pen 1	195	51	552	586	34	44.1
" 2	109	12	350	370	20	
" 3	196	....	534	564	30	
" 4	110	....	356	370	14	
SIXTH WEEK—November 1st to November 8th.						
Pen 1	149	109	586	614	28	40.9
" 2	109	41	370	400	30	
" 3	164	....	564	586	22	
" 4	112	....	370	394	24	
SEVENTH WEEK—November 8th to November 15th.						
Pen 1	164	119	614	650	36	42.1
" 2	92	36	400	416	16	
" 3	145	....	586	620	34	
" 4	77	....	394	404	10	
EIGHTH WEEK—November 15th to November 22d.						
Pen 1	157	59	650	662	12	36.5
" 2	79	29	416	418	2	
" 3	139	....	620	638	18	
" 4	85	....	404	414	10	
NINTH WEEK—November 22d to November 29th.						
Pen 1	150	78	662	690	28	34.6
" 2	73	47	418	426	8	
" 3	132	....	638	640	2	
" 4	92	....	414	428	14	

TABLE I.—Continued.

Number of pen.	Corn eaten—pounds.	Roots eaten—pounds.	Weight at beginning of week.	Weight at end of week—pounds.	Gain for week—pounds.	Average temperature for each week—Degrees, Fahr.
TENTH WEEK—November 29th to December 6th.						
Pen 1	138	77	690	702	12	33.5
" 2	79	50	426	444	18	
" 3	136	....	640	664	24	
" 4	88	....	428	430	2	
ELEVENTH WEEK—December 6th to December 13th.						
Pen 1	131	65	702	718	16	37.5
" 2	80	43	444	450	6	
" 3	139	....	664	680	16	
" 4	84	....	430	444	14	
TWELFTH WEEK—December 13th to December 20th.						
Pen 1	132	48	718	730	12	19.7
" 2	69	35	450	448	—2	
" 3	128	....	680	684	4	
" 4	89	....	444	450	6	

The figures given in the above table may be summarized as follows:

	Total corn eaten.—pounds.	Total roots eaten.—pounds.	Total increase.—pounds.	Food consumed for 1 pound of increase.—pounds.
Pen 1	2,045	806	310	Corn, 6.6 Roots, 2.6
Pen 2	1,158	407	162	Corn, 7.2 Roots, 2.5
Pen 3	1,981	....	272	Corn, 7.3
Pen 4	1,169	....	160	Corn, 7.3

It will be seen that the three Berkshires in pen 1 consumed more roots, proportionally, than the two Poland Chinas in pen 2. They also ate more corn than the Berkshires in pen 3, which received no roots. In the first case, however, for every 6.6 pounds of corn eaten there was one pound of increase; or every bushel (70 pounds of corn) fed gave 10.6 pounds additional weight. In pen 3, where no roots were fed, it took 7.3 pounds of corn for each pound of increase; or every bushel of corn fed gave 9.3 pounds additional weight.

In pen 4, Poland Chinas fed on corn alone, the amount consumed for each pound of increase was precisely the same as that reqnired by the Berkshires in pen 3.

The Polands in pen 2 ate 2.5 pounds of roots and 7.3 pounds of corn for every pound of increase.

The Berkshires in pen 1 ate 2.6 pounds of roots and 6.6 pounds of corn for each pound of gain.

As far as breeds are concerned the above tests show but little difference. If there is any choice, it favors the Berkshires. They appeared a little more hardy, were not quite so easily affected by changes of temperature, ate more regularly, and showed less fluctuation in the amount of increase. With better shelter, or with older pigs, these results might be changed.

In Table II the time covered by the experiment is divided into three periods of four weeks each. Special attention is called to the average temperature of each period. It will be seen that the best results for the food consumed were reached in the second period. This was probably due to the increased age of the pigs. The low temperature of the third period explains the falling off in flesh production at that time.

TABLE II.—First Period of Four Weeks.

	Corn eaten.	Roots eaten.	Total increase.	Food eaten for one pound of increase.		Average temperature for period.
				Corn.	Roots.	
Pen 1..........	830	200	132	6.3	1.5	59.7°
Pen 2..........	468	114	64	7.3	1.8	
Pen 3..........	802	....	122	6.6	....	
Pen 4..........	432	....	66	6.5	....	
Second Period of Four Weeks.						
Pen 1..........	665	338	110	6.0	3.1	40.9°
Pen 2..........	389	118	68	5.7	1.7	
Pen 3..........	644	....	104	6.2	....	
Pen 4..........	384	....	58	6.6	....	
Third Period of Four Weeks.						
Pen 1..........	551	268	68	8.1	3.9	31.3
Pen 2..........	301	175	30	10.0	5.8	
Pen 3..........	535	....	46	11.6	....	
Pen 4..........	353	....	36	9.8	....	

Indian corn is the grain that is used almost exclusively in this countr fattening pigs. It is cheaper than any other, and makes better pork. W fed judiciously, even at the present low price of pork, the corn crop ca made to pay a fair profit. Just how much the nutritive value and fatte power of this simple, unchanging ration can be incréased by adding to small proportion of roots is not yet clearly established.

The utility of roots for milking or breeding animals has been proved. ther experiment will be necessary before their value as a food for fatte stock is fully determined. In this connection the following analyses will interest. The first two were made by the Station Chemist, Prof. H. A. We The last two are the average composition as compiled by Dr. E. H. Jen of the Connecticut Experiment Station, from analyses made in this count

	CARROTS.	SUGAR-BE
Water	86.52	87.24
Protein	.84	1.76
Fat	.20	.06
Nitrogen, free extract	10.40	9.13
Crude fiber	.99	.88
Ash	1.05	.93

	POTATOES.	CORN (De
Water	78.65	10.07
Protein	1.23	10.36
Fat	.13	5.15
Nitrogen, free extract	18.72	70.60
Crude fiber	.38	2.29
Ash	.89	1.53

REPORT OF THE HORTICULTURIST.

SMALL FRUITS.

Raspberries and strawberries were the only small fruits in bearing on the experiment grounds last season. A trial of varieties comprised the greater part of the work accomplished. Some interesting experiments in cross-fertilization were also conducted. Many of the old and well known varieties were planted for the sake of comparison, and for other experimental purposes. New varieties have been obtained as soon as offered for sale, and in some cases before. Quite a number of originators of new varieties have placed them here on trial. It is gratifying to state that no one who has been asked to send a variety on trial, has refused. The Station solicits varieties for testing before they are offered for sale, but nothing is desired unless it is supposed to have some merit. Such restrictions as are proper in cases of this kind may be imposed. All that the Station desires is not to be hampered in any way, in making a fair trial, and an impartial report when the variety is offered for sale.

RASPBERRIES.

Nearly all the varieties named below were planted in the spring of 1883, hence the notes are necessarily incomplete. The list has since been extended by the addition of new varieties.

The estimate of hardiness was made in February, and later observations may necessitate some changes. The plants at the beginning of winter were well ripened, and apparently in a good condition to withstand severe freezing. The winter, thus far, has been very severe, the thermometer registering as low as 21° below zero.

Black Varieties.

Gregg.—This variety was injured considerably in January, 1884, when the temperature was 32° below zero, but has apparently withstood the present winter unharmed.

Ohio.—Suffered somewhat less than Gregg upon the same soil, but in a part of the field where the ground was quite rich the plants were injured greatly.

Souhegan and Tyler.—Although probably not identical, their size and time of ripening are the same, and in appearance are scarcely distinguishable. Ripe June 20, or about ten days earlier than the Ohio. Where earliness is desirable they may be valuable, but they seem to have no qualities that can recommend them for general planting, being much smaller than later varieties, and coming in competition with berries from the South.

Several other varieties are on trial.

Red Varieties.

Cuthbert.—Injured to some extent by the cold, but not seriously. This is certainly a desirable variety. Berries of good size and color; quite firm; quality good; plants healthy and vigorous. Ripe July 5.

Crimson Beauty.—Injured considerably during the present winter. Plants bore but little fruit. Berries of good size and fine color; quite firm; quality medium.

Hansell.—Not seriously injured by the cold. Berries rather above medium size; color bright crimson; quite firm; quality medium. Ripe June 20. This variety seems to lack vigor and productiveness here.

Lost Rubies.—Resembles the Naomi greatly; at least is no better. Injured to some extent by the cold.

Marlboro.—Withstood the cold perfectly. A few plants were sent to the Station on trial, in the spring of 1884, by A. J. Caywood & Son. The plants were carefully dug and bore a large number of very fine berries. Berries large and of good color, presenting a fine appearance, very firm and of good quality. This variety will probably take a high rank among market sorts.

Montclair.—Injured slightly by the cold weather. Berries of good size and color, but rather soft.

Superb.—Killed to the ground in January, 1884, and considerably injured the present winter.

Shaffer's Colossal.—Berries large, dark purple, rather unattractive in appearance, but of excellent quality. Ripe June 30. Undoubtedly better for home use than for market.

Turner.—Considerably injured in January, 1884, but has passed the present winter safely.

STRAWBERRIES.

The varieties named in this report, except those noted, were planted in the spring of 1883. The soil was a moderately rich clay loam, and was fertilized with a light dressing of stable manure. Ordinary cultivation was given, and the runners allowed to take root, forming matted rows. In the fall the bed was covered with straw, which was allowed to remain until after the fruit was gathered. The account of the newer varieties is not as complete as desirable, for the reason that the plants were set in the fall, 1883, and the season being dry until late, the growth was weak, hence but little fruit was borne. No attempt was made to estimate yields, because the plots were not sufficiently uniform to admit a fair comparison. A number of new varieties have since been planted, many of which have not been offered for sale, as yet.

A full discription of all the varieties is thought to be unnecessary, but the prominent characteristics of each are given, together with such notes as cannot be conveniently tabulated. *Bisexual* or *perfect*, are used instead of *staminate*; and *imperfect* for *pistillate*. These words are preferable because they have a more definite meaning. No varieties having staminate flowers only, are cultivated, and our observations show that nearly all of the so-called pistillate varieties produce a small amount of pollen, hence are not perfectly pistillate.

Alpha.—Conical; bright crimson; moderately firm; quality medium; calyx adheres quite well in picking; plants healthy, fairly vigorous and moderately productive. Its earliness is its chief value, but is not sufficiently productive.

Atlantic.—The plants of this variety were set in the fall and bore but little fruit. Berries conical; much longer than broad, with a short neck; bright glossy crimson; quite firm; quality good; flowers perfect; plants healthy and moderately vigorous. Further trial is necessary before speaking with confidence as to its value, but it exhibited no remarkable qualities last season.

Bidwell.—Long conical, with short neck; color, light crimson, becoming darker when fully ripe; quite glossy, but many of the berries have a seedy appearance, which renders them unattractive; moderately firm; calyx large and quite strongly adherent; quality medium; flowers perfect, but the number of stamens quite variable; foliage healthy and vigorous. Although the plants are quite thrifty, they are apparently unable to mature all the fruit that sets.

Bright Ida.—Broadly conical; regular in form, but rather uneven in size; color bright scarlet; quite firm; quality medium; flowers perfect; foliage quite strong and healthy.

Big Bob.—Conical; often irregular and knotty as though poorly fertilized; color crimson; quite firm; flowers imperfect, although not strictly pistillate, for a small quantity of pollen can be found in the anthers; foliage moderately vigorous. Plants unproductive, and fruit poor. Very unsatisfactory here.

Charles Downing.—Conical; quite regular; bright glossy scarlet; moderately firm; juicy and rich; flowers perfect, and plants quite vigorous. In most sections this is a popular variety, but it is unproductive here. The berries hold out well in size however, and the plants are more productive the second and third years than the first. This is a good variety to plant with imperfect flowering sorts, as it furnishes a plentiful supply of pollen, and our observations show that it imparts to a considerable degree its own glossy appearance to the berries of varieties which it fertilizes.

Captain Jack.—Regular; conical; dark crimson; rather acid, and of poor quality; flowers perfect; foliage dark green and healthy. Quite produc but the berries are only medium size at first, and run very small toward last. Should be discarded.

Cumberland Triumph.—Broadly conical; light scarlet; soft; quality medi calyx parts quite easily from the fruit when picking; flowers perfect; fol healthy and vigorous. Not sufficiently productive in this section, but impr with age. Suitable for home use and near market.

Crescent Seedling.—Conical; sometimes flattened and irregular, but usu quite uniform in size; light scarlet; rather soft; quite acid; quality medi not strictly pistillate, although the anthers are poorly developed, and bear little pollen. The plants are very vigorous and productive, although some more infested by the leaf roller than most other varieties. In this section Crescent is the most profitable of all varieties, and bears much the s reputation elsewhere.

Cornelia.—The plants of this variety were planted late in the fall, and not sufficiently large to bear a full crop. Berries conical, rather longer broad; bright glossy scarlet, although not brilliant; very firm; calyx strongly adherent; flavor good, and by some considered excellent; flo imperfect; foliage healthy and vigorous. This is a very promising variety, but not fully tested as to productiveness.

Daniel Boone.—The plants of this variety were also set in the fall, b fair crop was produced. Berries long conical; quite regular; bright gl scarlet; quite firm; quality medium; flowers imperfect; foliage dark green vigorous. Very promising.

Endicott's Seedling.—Broadly conical; point often flattened; bright gl crimson; deeply pitted; firm; flowers perfect; plants healthy but not v ous. Unproductive here.

Early Canada.—Conical; dark crimson; firm; quality medium; flo perfect; foliage healthy and moderately vigorous. Very early, but the be are small, the last ones being hardly worth picking.

Finch's Prolific.—Broadly conical; very regular; bright scarlet; f quality good; flowers perfect, with anthers well developed, furnishing a l quantity of pollen. Plants quite vigorous, but only moderately productiv

Gypsy.—Conical; regular; dark glossy crimson; quality excellent; flo imperfect; plants healthy but only moderately vigorous and productive.

Hart's Minnesota.—Conical; bright scarlet; moderately firm; rather a and of medium quality; flowers perfect; plants vigorous and quite produc A promising variety.

Idaline.—A seedling from G. W. Trowbridge; possesses many good q ities, but the plants lack in vigor, and were badly affected by the rust, he the fruit did not mature perfectly.

Jersey Queen.—Broadly conical; sometimes flattened and slightly kidney shaped; light glossy scarlet; moderately firm; flavor good; flowers imperfect; plants moderately vigorous, but rather unproductive. This variety will probably not sustain the reputation it has gained.

James Vick.—Conical; very regular; bright crimson; firm; quality poor; flowers perfect; plants vigorous. More berries set than can mature. The berries are below the medium size at the beginning of the season, and too small to pay for picking toward the last. Perhaps further trial may show the merits of this variety, but the present indications are that it will soon be dropped from the list. It may do better in hills.

Kentucky.—Conical; usually ribbed; light scarlet; moderately firm; flowers perfect; plants strong and moderately productive. For a late variety it is doubtful if it is excelled, although several new sorts are strong rivals. A seedling of this variety from G. W. Trowbride resembles it greatly, but is much more productive. This is certainly a very promising variety.

Lacon.—Conical; often cockscombed and irregular; bright crimson; rather soft; quality medium; flowers perfect; plants very vigorous and productive. This variety has many good qualities, and is deserving of further trial. Much of the fruit is borne near the ground, making picking difficult.

Maggie.—Broadly conical; scarlet; rather soft; mealy and poor flavor; flowers perfect; plants unproductive.

Miner's Prolific.—Conical; quite regular; deep, glossy crimson, where fully exposed to the sun; rather soft, but of excellent flavor; flowers perfect; plants vigorous and very productive. A very excellent variety for home use or near market. Requires care in picking, as it does not always color well, which appears to be its greatest fault. A good variety to plant with imperfect flowering sorts.

Manchester.—Conical; quite regular and uniform in size; bright scarlet, with but little gloss; quite firm; quality medium; calyx adheres quite well in picking; flowers nearly pistillate, producing a very small amount of pollen; plants moderately vigorous; affected considerably by the rust. This variety doubtless has much to recommend it, where it does well, but it can hardly be said to be equal to the best here.

Mrs. Garfield.—The plants of this variety were set in the fall, and did not make sufficient growth to produce many berries, hence it is impossible to give a decided opinion concerning it. The plants seem to lack vigor here, but may do well elsewhere. Further trial is necessary.

Mt. Vernon.—Broadly conical; quite regular and uniform in size; color scarlet, quite attractive in appearance; moderately firm; flowers perfect; plants healthy and vigorous, but rather unproductive. This is a late variety, possessing many good qualities, but probably not sufficiently productive to be profitable.

Norman.—Conical; often pointed; dark red, glossy; quite acid; quality medium; flowers perfect; plants vigorous and fairly productive.

New Dominion.—Conical; regular; light glossy crimson; firm; flavor good; plants dwarfed; lacking in vigor and productiveness. Not worthy of cultivation here.

Nigh's Superb.—Berries conical, much longer than broad; sometimes flattened at the sides; bright, glossy scarlet; rather soft; flowers perfect; plants lack in vigor and productiveness. The berries are often full of hard lumps, and extremely variable in flavor from good to very poor. This variety apparently has little to recommend it.

Old Iron Clad.—Berries broadly conical; often irregular; light scarlet; quite firm; quality medium; flowers perfect; foliage subject to blight. This variety did quite poorly here. The plants apparently were unable to mature the large number of berries that formed. The berries were quite small and full of hard lumps.

Oliver Goldsmith.—Conical, with long neck; light scarlet; rather soft; quality medium; flowers perfect; foliage healthy; moderately productive.

Piper's Seedling.—Broadly conical; often flattened and irregular; dark, glossy crimson; nearly black when very ripe; quite firm; quality good; flowers perfect; plants strong, healthy and very productive. This is a very promising variety. It was affected by the drouth rather more than most other varieties.

Pautuxet.—Conical; often flattened at the point; scarlet; firm; flowers perfect; plants seem to lack vigor and consequently productiveness; leaves considerably affected by blight; did very poorly here.

Prince of Berries.—The plants of this variety were set in the fall and made a poor growth, consequently but little fruit was seen; not enough at least to warrant giving an opinion concerning it. The plants appear to lack vigor here, but it is said to grow well in other localities.

Photo.—Berries conical; dark crimson, glossy; rather soft; quality excellent; flowers imperfect; plants rather weak, somewhat inclined to rust. This is an excellent berry for home use in localities where it does well, but lacks somewhat in vigor and is unsatisfactory here.

Red Jacket.—Berries nearly spherical; dark, glossy crimson; deeply pitted; acid; medium quality. This variety did very poorly, the foliage rusted badly and the berries were small and inferior.

Russel's Advance.—Conical; very regular; light scarlet; rather soft; quite acid and not highly flavored; flowers perfect; plants quite vigorous. Berries too light colored and soft for market and not good enough in quality for home use.

Ray's Prolific.—Conical; roundish; often flattened at sides and at the point; light scarlet; calyx parts very easily from the berry when picking; plants only moderately vigorous and rather unproductive, while the berries are small and ill shaped.

Sharpless.—Conical; often cockscombed; clear, light crimson, glossy; moderately firm; quality good; flowers perfect, although the number of stamens and amount of pollen vary considerably. This variety has done only fairly well here, and seems to be perfectly adapted to only a few localities.

Sucker State.—Berries conical; often nearly spherical; very regular in outline and uniform in size; light scarlet; very attractive; flowers perfect; plants healthy, vigorous and productive. This is a very promising variety, bearing large crops and holding out well in size to the last. The berries are rather too light in color; calyx parts quite easily in picking.

Satin Gloss.—Berries long, conical; dark, glossy crimson; quite firm; quality good; flowers perfect; plants moderately vigorous, but unproductive. Not profitable here.

Windsor Chief.—Long, conical, quite regular; dark, glossy crimson; moderately firm; quite acid and below medium in quality; flowers imperfect, although some pollen is usually present in the anthers; plants vigorous and productive. This is certainly a very valuable variety for near market, being nearly equal to the Crescent in productiveness.

Woodward.—Berries usually long, conical; sometimes nearly egg shaped; color dark, glossy crimson; firm; rather acid and not highly flavored; flowers perfect; plants quite vigorous, but rather unproductive.

The following table gives the date of first appearance of bloom, the date of first and last ripe fruit, and number of days in bearing. The last appearance of bloom in any variety usually corresponds very nearly with the time of first ripe fruit. The table will serve as a guide in the selection of perfect and imperfect flowering varieties to plant together. The perfect flowering are marked P., and those with imperfect flowers are marked Imp. It will be possible also, with the aid of the table, to select varieties that come in succession. Although the comparative time of blooming and ripening of fruit may vary to some extent, in different seasons and upon different soils, the variation will not be sufficient to greatly impair the value of the table.

TABLE I.

Name of variety.	First appearance of bloom.	First ripe fruit.	Last ripe fruit.
Alpha, P	May 6	May 28	June 19
Atlantic, P	" 6	June 5	....
Bright Ida, P	" 6	" 9	June 23
Bidwell, P	" 6	" 4	" 23
Big Bob, Imp	" 12	" 8	" 24
Captain Jack, P	" 6	" 5	" 23
Cumberland Triumph, P	" 6	" 4	" 25
Charles Downing, P	" 6	" 4	" 28
Crescent Seedling, Imp	" 6	May 30	" 23
Cornelia, Imp	" 15	June 9	....
Daniel Boone, Imp	" 6	" 8	....
Endicott's Seedling, P	" 10	" 8	June 23
Early Canada, P	" 3	May 28	" 19
Finch's Prolific, P	" 6	June 4	" 23
Gypsy, Imp	" 6	" 5	" 23
Hart's Minnesota, P	" 6	" 5	" 23
Jersey Queen, Imp	" 12	" 9	" 23
James Vick, P	" 10	" 8	" 23
Kentcky, P	" 12	" 8	July 2
Lacon, P	" 6	" 5	June 25
Maggie, P	" 6	" 5	" 23
Miner's Prolific, P	" 6	" 2	" 28
Manchester, Imp	" 6	" 7	" 23
Mt. Vernon, P	" 12	" 8	" 28
Norman, P	" 6	" 5	" 19
New Dominion, P	" 6	" 8	" 23
Nigh's Superb, P	" 6	" 2	" 23
Old Iron Clad, P	" 6	" 2	" 19
Oliver Goldsmith, P	" 6	" 5	" 23
Piper's Seedling, P	" 6	" 2	" 23
Pautuxet, P	" 10	" 5	" 19
Prince of Berries, P	" 10	" 5	....
Red Jacket, P	" 6	" 4	June 23
Ray's Prolific, P	" 6	" 4	" 23
Sharpless, P	" 6	" 5	" 28
Sucker State, P	" 6	" 7	" 25
Satin Gloss, P	" 6	" 9	" 15
Windsor Chief, Imp	" 6	" 2	" 23
Woodward, P	" 6	" 9	" 23

Table II shows the comparative size of berries of different varieties. drouth which commenced before the fruit was all gathered, affected varieties more than others, hence the unfavorable showing in several insta

Such comparisons will doubtless vary much in different localities, and year to year in the some locality, hence must be considered as appro tions to the truth merely. It will be seen, however, that many of the known, standard varieties make about the same showing that they have where; hence, the table must have more or less value in all sections. The first and second colums are intended to show each variety at its best.

Ten of the finest berries of the first picking were weighed and measured; the results given in ounces and inches. The circumference was taken at right angles to the axis, but in no instance was the measurement made around the berry lengthwise; nor was an effort made to measure in and out over the irregularities.

The other columns give the number of berries in a quart at each picking. This is intended to show not only the comparative size, but how well each variety held out.

Doubtless, the last two columns do not represent perfectly fair comparisons, except as to ability to withstand drouth.

TABLE II.

Name of variety.	First picking.		Number of berries in a quart.			
	Weight in ounces of ten berries.	Average circumference in inches.	Second picking.	Third picking.	Fourth picking.	Fifth picking.
Alpha	2½	3 2-5	196	205	400	....
Atlantic	1⅝	3	....	....	....	....
Bidwell	3¾	4½	100	139	188	212
Big Bob	3½	4	106	145	162	....
Capt. Jack	2¾	3½	132	256	350	....
Cumberland Triumph	5¼	4⅝	79	162	294	....
Chas. Downing	3½	3⅝	100	220	327	....
Crescent Seedling	2¾	3⅛	110	196	252	....
Daniel Boone	2	3	....	....	....	....
Finch's Prolific	3½	3⅝	....	....	....	....
Gypsy	3¾	3½	140	191	243	....
Hart's Minnesota	3	3⅝	118	131	168	204
Jersey Queen	4¾	5⅜	105	150	....	....
James Vick	2¼	3¼	113	183	274	322
Kentucky	2¾	4	110	140	187	271
Lacon	3½	3	112	135	138	201
Miner's Prolific	4¾	4	75	121	208	327
Manchester	3	3⅝	....	....	....	....
Mt. Vernon	3½	4⅛	98	160	200	250
Norman	3¾	3⅛	....	....	....	....
New Dominion	2¾	3⅛	139	200	224	....
Nigh's Superb	2½	3	102	177	239	304
Piper's Seedling	3	4	93	204	360	....
Red Jacket	2¼	3⅛	150	187	280	302
Russel's Advance	....	....	101	129	172	289
Ray's Prolific	2¼	3½	....	....	....	....
Sharpless	5¼	4½	57	94	197	240
Sucker State	3¼	3¾	70	144	250	271
Satin Gloss	1¾	2¼	....	....	....	....
Windsor Chief	2¾	3⅛	112	175	224	312

It was not possible, for several reasons, to keep a record of the actual of plots, hence a table of comparative productiveness cannot be given. customary with introducers of new varieties to count the number of fruit per plant, and the number of berries per fruit stalk, thus giving, when are grown in hills, estimates of wonderful productiveness.

With a view to testing this method, a table has been prepared showi number of fruit stalks per plant and the number of berries per fruit Twenty plants of each variety were examined, the lowest and highest n given, also the average. The plants were grown in matted rows, and as possible average specimens were taken. It is evident that this method of parison, to be of any value, must be taken in connection with other fa such as vigor of plants, number of plants produced, size of berries, etc.

The Crescent Seedling has on an average not more than ten berri plant, yet its great vigor, and the large number of plants produced expl productiveness. Hart's Minnesota also ranks low, notwithstanding it is productive. Miner's Prolific apparently ought to be rated much higher. sor Chief, although productive, is rated low according to this method.

Although the table can have but little value as a measure of productiv it shows very clearly that the fault of many varieties is setting more b than the plants have strength to ripen. Especially is this true of those ties that show extremes as to number of berries. Bidwell is one of this sometimes having fifty berries per plant, all of which cannot ripen. Bi also lacks the vigor to carry through thirty or more berries per plant, as seen. Capt. Jack and James Vick although vigorous, produce numb berries at the expense of size. Lacon has somewhat the same failing. Superb, Old Iron Clad and Red Jacket belong to the same class.

Those bearing the largest berries will be noted as having only a mo number per plant. On the whole it may be said that overproductivene fault rather than a virtue, which fact the table illustrates.

TABLE III.

Name of variety.	Number of fruit stalks per plant.	Number of berries per fruit stalk.	Average number berries per fruit stalk.
Alpha	1 to 3	4 to 12	7
Atlantic	1 to 3	3 to 8	5
Bright Ida	1 to 2	4 to 14	9
Bidwell	2 to 3	6 to 20	12
Big Bob	1 to 2	7 to 20	12
Capt. Jack	1 to 2	8 to 21	13
Cumberland Triumph	1 to 3	6 to 11	8
Chas. Downing	2 to 3	6 to 15	8
Crescent Seedling	1 to 2	6 to 19	10
Daniel Boone	1 to 2	5 to 11	8
Endicott's Seedling	1 to 2	7 to 15	9
Early Canada	1 to 3	4 to 14	8
Finch's Prolific	2 to 3	5 to 14	8
Gypsy	1 to 2	4 to 10	6
Hart's Minnesota	1 to 2	5 to 13	8
Jersey Queen	1 to 2	5 to 14	8
James Vick	2 to 5	10 to 31	15
Kentucky	1 to 2	8 to 17	12
Lacon	1 to 5	6 to 21	9
Maggie	1 to 3	5 to 18	10
Miner's Prolific	2 to 4	7 to 19	11
Manchester	1 to 2	5 to 17	10
Mt. Vernon	1 to 2	9 to 18	12
Norman	1 to 2	4 to 11	7
New Dominion	1 to 2	4 to 9	6
Nigh's Superb	1 to 2	7 to 19	11
Old Iron Clad	1 to 3	6 to 23	11
Piper's Seedling	2 to 4	6 to 16	12
Pantuxet	1 to 4	4 to 8	6
Red Jacket	1 to 2	7 to 20	10
Russel's Advance	1 to 2	7 to 16	14
Ray's Prolific	2 to 3	5 to 12	7
Sharpless	1 to 2	6 to 15	9
Sucker State	1 to 3	6 to 16	11
Windsor Chief	2 to 3	7 to 12	10

There is quite a difference in varieties as to number of stamens and quantity of pollen; also considerable variation in any given variety. The stamens of a considerable number of flowers of each variety were counted. The result is given in the table following. This, however, is not a matter of very great importance, unless it is desired to use the least possible number of plants of perfect flowering varieties. An abundant supply is desirable, and the table shows which varieties are most prolific in pollen. Taking this table in connection with the one giving the time of blooming, it will be possible for even those of limited experience to select the proper bise or perfect flowering varieties, to plant with any of the so-called pistillate v ties. Is is probable that the amount of pollen of any given variety varies s what in different localities, and in different seasons in the same locality. would most likely be true of those showing the greatest variation in the nu of stamens.

TABLE IV.

Name of variety.	Least number of stamens.	Greatest number of stamens.	Average number of stamens.	Remarks.
Bidwell	3	30	20	Pollen quite plentiful.
Cumberland Triumph	24	34	28	" abundant.
Capt. Jack	18	24	20	" "
Chas. Downing	16	29	24	" "
Finch's Prolific	20	28	24	" very abundant.
Hart's Minnesota	25	50	33	" "
James Vick	19	25	23	" "
Kentucky	16	25	21	" moderately abund
Lacon	16	29	33	" "
Miner's Prolific	23	31	26	" very abundant.
Nigh's Superb	18	32	25	" "
Old Iron Clad	21	30	25	" "
Piper's Seedling	15	23	19	" moderately abunda
Pautuxet	13	24	18	" "
Russel's Advance	18	27	22	" "
Sucker State	22	28	25	" "
Sharpless	20	28	24	" not abundant.

CROSS-FERTILIZATION.

To determine the effect produced upon the fruit, or berry, when varieties are crossed, pollen was applied artificially to the stigmas of several so-called pistillate varieties. Boxes, or frames, about fifteen inches square, were placed over the plants of Crescent Seedling, Manchester, and several other varieties previous to the time of blossoming. These frames were covered with whitewashed glass during the period of bloom. Pollen was taken from the following varieties and applied to the stigmas of the imperfect flowering varieties which were under glass: Downing, Cumberland Triumph, James Vick, Sharpless. The glass was removed from the frames as soon as the period of blossoming had passed. The fruit was not in all cases perfect, hence it was not possible to make as large a number of comparisons as desirable. In each case, however, a few perfect berries were produced. The berries produced by crossing the Downing and Crescent Seedling, showed the characteristic gloss of the Downing. The berries from the cross of James Vick and Crescent Seedling were quite small, but remarkably firm and perfect in form. The berries from the cross of Cumberland Triumph and Crescent Seedling showed in a marked degree the qualities of the former, viz: texture and color, being very soft and of quite light color. The same results were obtained where Sharpless was used. The varieties named crossed with the Manchester gave the same general results. Duplicate tests were made in all cases.

Several frames were kept covered and no pollen applied, but in no instance was fruit produced, except in one case where the glass was accidentally removed. Several frames were placed over plants of perfect flowering varieties, and kept covered during the period of bloom. Fruit was perfected in each instance, hence it is safe to conclude that the conditions were perfect.

Although the experiments indicate that the form, size, color, and general appearance of the berry is modified by cross-fertilization, further experiments are necessary to determine accurately, and fully characterize these modifications.

EFFECT OF MULCHING.

It is believed by some small fruit growers, that frost does a greater i upon strawberry beds mulched with straw than where the ground is left A few observations were taken, by means of minimum thermometers, p near the earth, over straw and over bare ground. Several thermometers also placed in different parts of the field for the purpose of compariso each case one on straw and one on bare ground. These were exar several times before sunrise, and were found to show about the same re temperature as the minimum thermometers, but the latter, being goverr standard and self-registering, were the only ones from which the readings taken. The area of the strawberry bed was about an acre. The whol been mulched with wheat straw the fall previous, but early in the sprin straw was removed from a strip about three rods wide along the north and from a similar strip near the center of the bed.

One thermometer was placed near the center of the strip of bare gr and another about three rods distant over the straw. The trial was ma several locations, but with the same general results. In one instance th perature was lower over bare ground than over straw; in another it wa cisely the same; but in all other instances it was lower over straw than bare ground. In some instances there appears to be sufficient differe temperature to cause a frost on straw, while unmulched portions might es How often this might occur, and what the average difference is, cann stated, because the observations are too few in number to make generali possible. The record is given, not for the purpose of illustrating a la rather by way of suggestion of what it is hoped may be done here and where. The daily record kept by the Station is also given for compa The Station thermometers are kept in a case, about four feet from the gr and about six hundred feet east of the strawberry bed.

	Over straw.	Over bare ground.	Stati reco
	Degrees.	*Degrees.*	*Degr*
May 17	29½	33	3
May 18	37	40	4
May 19	48½	52	5
May 20	45	46½	5
May 21	36½	40	4
May 22	48½	51	5
May 23	59	60½	6
May 24	53½	57	5
May 25	45	47½	5
May 26	49¾	53¼	5
May 27	43½	51½	5
May 28	43	44	4
May 29	25	27½	3
May 30	32	32	3
May 31	54½	48	4
June 1	39	41½	4

SPECIAL LISTS OF VARIETIES ADAPTED TO PARTICULAR LOCALITIES.

A circular was sent to fruit growers in various parts of the State for the purpose of ascertaining the varieties of small fruits that have proved of greatest value in particular sections. The questions asked had reference to soil, drainage, location, as to elevation and exposure, and varieties grown. The blank was so arranged that the person filling it out could give his opinion of each variety, by marking on a scale of 0 to 10, under the headings "Value for home use," "Value for market," "Hardiness," "Healthfulness," and "Productiveness." The circulars were quite generally filled out and returned, many of them showing evidence of careful and extended observation. From some counties several answers were received, but from others none. An average of the grades, or figures given, was taken as a basis in making out the lists. The quotations given are from the notes appended to each variety by those filling out the blanks.

These lists form a condensed fund of information, concerning varieties, that cannot fail to be useful to new beginners and may be suggestive to those of long experience. As far as possible varieties are named in the order of excellence, but in some cases this could not be done as several varieties were graded equally high. In all cases the best are given first, next the doubtful, then the poorest.

The abbreviations used are S. B. for strawberries, R. B. for raspberries, B. B. for blackberries. Currants and gooseberries are put in the general list for the State, and are not included here because there was so little disagreement in the reports given. General value is meant unless market or home value is specified.

Ashtabula County.—S. B., Crescent, Wilson, Sharpless, Bidwell. R. B., Cuthbert, Tyler, Gregg, Doolittle.

Belmont County.—S. B., Crescent; "A valuable berry for all;" "The lazy man's berry." Wilson; "Sourness is its greatest fault." Sharpless; "The most easily affected by frost;" "Our favorite, all things considered." Charles Downing. Cumberland Triumph; "Poor shipper;" "One of the very best." Miner's Prolific is rated quite high. Manchester, promising. Bidwell; "Productive to a fault." Mt. Vernon, Old Iron Clad, and Big Bob are spoken of unfavorably. R. B., Gregg; "Best late variety." Ohio; "Best for evaporating." Cuthbert; "Thought well of here." Shaffer's Colossal; "Best for home use." Tyler and Souhegan are thought to be too small. Doolittle; "Much liked." Hansell; "Poor grower, fruit small." Lost Rubies; "Worthless."

Butler County.—S. B., Crescent, Kentucky, Sharpless, Wilson. Finch's Prolific; "Discarded." Manchester; "Rusted, did not get a good specimen."

R. B., Doolittle, Gregg, Turner, Cuthbert, Thwack. B. B., Snyder, Taylor, Missouri Mammoth.

Columbiana County.—S. B., Crescent, Downing, Wilson, Cumberland Triumph, Bidwell, Sharpless, Kentucky, Manchester, Jucunda. R. B., Gregg, Doolittle, Shaffer's Colossal, Ohio, Souhegan, Cuthbert, Turner, Brandywine, Marlboro, recommended; Nemaha, said to be ten days earlier than Gregg and quite as large. B. B., Snyder, very hardy; Lawton and Kittatinny; "Quite tender." Wilson; "Very tender."

Champaign County.—S. B., Crescent; "Withstands frost better than any other." Cumberland Triumph; "One of the best." Mt. Vernon; "Best late." Manchester, Downing, Sharpless, Wilson. R. B., Gregg, Mammoth Cluster, Cuthbert. Turner; "Good every way." B. B., Lawton; "Tender."

Clermont County.—S. B., Cumberland Triumph; "Best for home use." Kentucky, Sharpless, Mt. Vernon, Wilson, Crescent.

Cuyahoga County.—S. B., Sharpless. Cumberland Triumph; "Too soft and light colored for market." Jucunda, Crescent, Wilson. Jersey Queen; "Too acid." Primo, Daniel Boone and Cornelia are thought well of. Big Bob; "Failure." R. B., Doolittle, Gregg, Turner, Cuthbert, Brandywine. B. B., Snyder, Taylor, Brunton's Early. Early Harvest; "Affected slightly by the rust." Lawton; "Tender."

Erie County.—S. B., Wilson; "Most reliable of all kinds tried." Crescent, Cumberland Triumph, Sharpless, Daniel Boone and Jersey Queen are recommended. James Vick; "Many small berries." R. B., Gregg, Doolittle, Souhegan, Shaffer's Colossal, Turner, Cuthbert. R. B., Snyder, Kittatinny. Lawton; "Has become worthless."

Holmes County.—S. B., Crescent Seedling, Cumberland Triumph, Sharpless. Miner's Prolific; "Does not always color well." Jersey Queen and Mount Vernon recommended. Manchester; "Rusted badly, fruit did not ripen well." R. B., Gregg, Doolittle, Ohio, Turner, Cuthbert, Shaffer's Colossal. B. B., Snyder; "The best here." Taylor.

Hamilton County.—S. B., Crescent Seedling, Wilson, Cumberland Triumph, Sharpless, Kentucky. Finch's Prolific; "Good quality, but unproductive." R. B., Turner, Cuthbert, Gregg, Ohio, Shaffer's Colossal. Hansell and Souhegan; "Promising." B. B., Snyder, Taylor. Stone's Hardy; "Promising, but rather small size." Lawton, "Rusts badly."

Lake County.—S. B., Crescent, Cumberland Triumph, Sharpless, Miner's Prolific. James Vick, "Too small." Manchester; "Not satisfied with it." R. B., Gregg, Souhegan, Shaffer's Colossal, Cuthbert, Brandywine, Turner. B. B., Snyder, Taylor, Lawton.

Lucas County.—S. B., Crescent, Manchester, Cumberland Triumph. R. B., Cuthbert, Turner, Gregg, Tyler, Shaffer's Colossal. B. B., Taylor, Snyder.

Mahoning County.—S. B., Crescent, Wilson, Cumberland Triumph, Sharpless. Big Bob; "A perfect humbug." Jersey Queen; "Another failure." R. B., Gregg, Tyler, Cuthbert, Turner, Shaffer's Colossal.

Meigs County.—S. B., Crescent, Sharpless, Kentucky, Glendale, Manchester. R. B., Turner, Cuthbert, Reliance, Shaffer's Colossal, Hansell.

Medina County.—S. B., Wilson, Jucunda, Downing, Sharpless, Crescent. R. B., Doolittle, Gregg, Turner, Brandywine. B. B., Snyder. Lawton; "Rusts badly."

Noble County.—S. B., Crescent, Sharpless, Miner's Prolific, Mt. Vernon. R. B., Gregg, Doolittle, Ohio, Cuthbert, Brandywine, Turner.

Preble County.—S. B., Wilson, Crescent, Kentucky, Sharpless. R. B., Doolittle, Gregg, Mammoth Cluster, Turner, Cuthbert, Shaffer's Colossal. B. B., Snyder, Lawton, Kittatinny.

Pickaway County.—S. B., Crescent, Kentucky, Glendale, Cumberland Triumph, Bidwell. Wonderful, recommended highly. R. B., Reliance; "One acre of this is worth more than two of any other red variety." Gregg, Ohio, Souhegan, Cuthbert.

Portage County.—S. B., rescent, Cumberland Triumph, Sharpless, Windsor Chief, Miner's Prolific. Wilson; "Generally discarded here." Manchester; "Very promising;" "A good variety." Big Bob; "Big Humbug." James Vick; "Small, sets more fruit than it can mature." Mrs. Garfield; "Doesn't realize expectations." Jersey Queen; "A superior variety." Phelp's Seedling; "One of the best." Mt. Vernon; "Lacks productiveness." R. B., Cuthbert, Reliance, Gregg, Souhegan. Shaffer's Colossal; "Has many imperfect pips." Lost Rubies; "No good." B. B., Snyder, Stone's Hardy, Taylor's Prolific. Western Triumph; "Promising." Kittatinny; "Discarded because of rust."

Richland County.—S. B., Wilson; "The standard market berry." Crescent. Windsor Chief; "Productive and Profitable." Cumberland Triumph. Miner's Prolific; "One of the best;" "Very handsome." Sharpless; "Variable." James Vick; "Wanting in size." Bidwell; "Good in favorable seasons." R. B., Gregg, Ohio, Souhegan, Shaffer's Colossal, Cuthbert, Brandywine, Hansell, Turner.

Ross County.—S. B., Crescent, Kentucky, Wilson, Miner's Prolific, Sharpless, Manchester. James Vick; "Too small." Wonderful is highly recommended. R. B., Chapman, (Ohio); "More planted here than any other black cap." Gregg; "Does not do well here." Reliance; "Best of a for this locality." Hansell; "Not adapted to this locality."

Summit County.— There is considerable conflict of opinion among tho ing reports from this county. S. B., Cumberland Triumph, Chas. Do Crescent, Wilson, Miner's Prolific, and Sharpless are highly recomm Glendale; "Valuable as a late berry." Manchester; "One of the Windsor Chief, Norman, Hart's Minnesota, Piper's Seedling, Jersey Arnold's Pride, Daniel Boone, and Lacon are marked high. R. B., Doolittle, Tyler, Brandywine, Turner, and Cuthbert are recommended. "The tenderest of all black caps." Shaffer's Colossal; "Canes keep all summer." Souhegan; "Not as good a grower as Tyler." Crimson is marked low under "hardiness." B. B., Snyder, Lawton, and Kit are not hardy.

Stark County.—S. B., Crescent, Miner's Prolific, Downing, Green P Windsor Chief, Kentucky, Sharpless, Cumberland Triumph. R. B., tle, Gregg, Turner, Cuthbert. B. B., Snyder. Lawton; "Get an en crop once in four or five years."

Scioto County.—S. B., Wilson, Crescent, Cumberland Triumph, Ke Sharpless, Manchester. R. B., Ohio, Gregg, Turner, Cuthbert. B. B ton, Kittatinny.

Sandusky County.—S. B., Crescent, Wilson, Sharpless, Black Defiance chester, Jersey Queen. James Vick; "Blossoms all killed by frost." B "Inferior, on account of green tips." R. B., Doolittle, Souhegan, Cu Turner, Ohio, Shaffer's Colossal. B. B., Snyder, Lawton, Kittatinny.

Trumbull County.—S. B., Crescent, Wilson, Cumberland Triumph, ing, Miner's Prolific, Sharpless. Manchester; "Sun scalds." Jersey "Poor cropper." James Vick; "Berries are small." Big Bob; "Go nothing." Mt. Vernon; "One of the best late varieties." R. B., Tyler, Turner, Brandywine. Mammoth Cluster; "Superseded."

Washington County.—S. B, Crescent, Miner's Prolific, Cumberlan umph, Sharpless, Glendale, Wilson. R. B., Reliance, Cuthbert, Greg hegan, Brandywine, Shaffer's Colossal. Early Prolific; "Liable to badly." Lost Rubies; "No good here."

Wayne County.—S. B., Crescent, Green Prolific, Sharpless, Wilson. Gregg, Doolittle, Cuthbert, Turner, Early Prolific.

Wood County.—S. B., Crescent, Sharpless, Green Prolific, Mancheste Vernon. Bidwell; "Not worth growing." R. B., Gregg, Ohio, Turner bert. B. B., Snyder. Taylor's Prolific; "Winters well." Lawton; " to winter kill."

GENERAL CATALOGUE OF VARIETIES OF SMALL FRUITS.

The following catalogue is made up from the lists of varieties given by those filling the blanks sent out. It is simply a combination of the preceding special lists of varieties, made by taking an average of all the replies received.

The figures under the different headings indicate the average of estimates placed upon each variety. The gradations are from 0, which indicates worthlessness, up to 10, which denotes perfection.

Some varieties vary greatly in different localities; others comparatively little. Excluding the variable varieties which are mentioned in the notes, the remaining ones may, with considerable accuracy, be divided into two classes, viz.: Those that do well in all parts of the State, and those that do well nowhere. Comparative ability of varieties to withstand frost, when in bloom, is a matter which has not hitherto received much attention.

This heading is omitted in the case of all the fruits except strawberries, for the reason that the data at hand were insufficient. Hardiness of strawberries is omitted for the same reason. The estimates given are doubtless near enough to the truth to be of considerable value, although they are only approximate.

Whatever may be the value of the catalogue, it is hoped that it will at least be suggestive. With a more general co-operation of fruit growers a work may be carried on in this direction that will yield invaluable results.

STRAWBERRIES.

Name of variety.	Value for market.	Value for home use.	Ability to withstand frost when in bloom.	Healthfulness or ability to withstand attacks of insects, fungi, etc.	Productiveness.	Remarks.
Alpha	5	5	7	7	6	Has little to recommend it.
Arnold's Pride	8	8	8	7	8	Not sufficiently tested.
Black Defiance	8	6	8	7	6	Highly recommended in some localities.
Bidwell	7	7	6	8	7	Reports concerning it vary greatly, but most of them are unfavorable.
Big Bob	5	5	6	7	5	May be dropped from the list without loss.
Captain Jack	7	5	8	8	8	May be dropped from the list without loss.
Crescent Seedling	8	5	9	9	9	More good reports are given of this than any other variety.
Cumberland Triumph	7	8	7	8	7	Is discarded by many, but esteemed by others.
Charles Downing	8	8	7	7	7	Is discarded by many, but esteemed by others.
Crystal City	3	4	8	8	6	Is not worthy of further trial.
Cornelia	8	8	9	8		Very late; promising.
Daniel Boone	8	8	7	9	7	Promising.
Duncan	6	8	7	8	8	Highly esteemed by many.
Early Canada	6	5	7	8	7	Too small, will be dropped.
Finch's Prolific	7	8	8	8	6	Generally reported as unproductive.
Gypsy	6	9	8	8	7	Much esteemed for its good quality.
Glendale	7	5	8	8	7	Generally discarded, but considered profitable by some.
Green Prolific	7	8	9	9	8	Same as above.
Grand Duke	6	8	7	7	7	Not sufficiently tested.
Hervey Davis	7	9	7	7	5	Esteemed in a few localities.
Hart's Minnesota	7	6	8	8	8	Not generally reported, but esteemed by a few.

James Vick	5	4	7	9	9	Only two favorable reports given; generally thought to be too small.
Jersey Queen	6	8	7	7	6	Reports concerning it vary greatly.
Jucunda	8	8	7	8	6	Hill culture and clay soil required, quite variable.
Kentucky	8	7	8	9	7	Is rated higher in the southern than in the northern part of the State.
Lacon	7	6	8	8	9	Produces too many berries.
Mt. Vernon	8	8	6	8	6	Blooms late, but flowers are much exposed.
Mrs. Garfield	7	8	7	7	7	Requires further trial.
Miner's Prolific	7	9	8	8	8	Probably better for home use than for market; quite generally liked.
Manchester	8	7	7	6	8	Does well in only a few localities.
Maggie	6	7	6	8	7	Flowers are much exposed to frost.
Nigh's Superb	5	5	6	8	6	Should be retained no longer.
Norman	8	7	8	7	7	Promising.
Old Iron Clad	7	7	8	7	8	Esteemed very highly by some, but reports concerning it are generally unfavorable.
Piper's Seedling	8	7	9	9	8	Does not seem to hold out well toward the last of the season; suffers from drought.
Photo	4	9	8	7	7	Too soft far market, but good for home use.
Primo	6	6	8	8	6	A poor grower on the Station grounds.
Pautuxet	6	7	7	7	7	Seems to be variable.
Ray's Prolific	5	5	8	8	7	Has many imperfect berries.
Sharpless	8	8	3	8	6	Extremely variable; is reported reliable in very few sections.
Seth Boyden	7	7	8	7	7	Requires damp, rich soil.
Sucker State	7	7	6	8	8	A good variety.
Warren	7	8	8	8	5	
Wilson	8	6	7	8	9	Is the standard variety in many localities, but is said to be failing in others.
Wonderful	9	7	8	9	9	Only two reports given; requires further trial; plants have grown well at the station.
Windsor Chief	8	6	6	8	9	Not generally reported, but esteemed wherever tried.

RASPBERRIES.

Name of variety.	Value for market.	Value for home use.	Hardiness.	Healthfulness or ability to withstand attacks of insects, fungi, etc.	Productiveness.	Remarks.
Beebe's Golden	6	8	9	9	8	Not generally reported.
Brandywine	8	6	8	8	8	Favorably mentioned except as to quality.
Crimson Beauty	7	7	6	8	7	Not fully tested.
Cuthbert	8	8	9	8	7	Some report it as a shy bearer, but it is usually praised very highly.
Delaware	7	8	9	7	8	Seems to have been tried in but few places.
Doolittle	8	8	9	6	9	Rusts badly in some localities, but is usually considered profitable.
Gregg	9	8	7	8	8	Very generally praised. Often marked low under "hardiness."
Hansell	7	7	8	8	6	Has but few friends in the State.
Hilburn	9	9	9	9	9	
Mammoth Cluster	7	7	8	8	6	Generally discarded.
Naomi	7	8	7	8	7	Seldom planted.
New Rochelle	7	7	8	8	9	
Ohio	8	7	9	9	8	Very highly praised, especially for evaporating.
Onandaga	6	6	8	9	8	
Reliance	8	9	8	9	9	Not widely planted, but receives much praise from those who have tried it.
Shaffer's Colossal	7	9	9	9	9	Is more highly praised for home use than any other variety.
Superb	7	8	7	8	7	
Souhegan	8	8	9	9	8	Souhegan and Tyler are usually marked the same. Both injured by frost last season when in bloom.
Tyler	8	8	9	9	8	
Thwack						

BLACKBERRIES, CURRANTS, AND GOOSEBERRIES.

Name of variety.	Value for market.	Value for home use.	Hardiness.	Healthfulness or ability to withstand attacks of insects, fungi, etc.	Productiveness.
BLACKBERRIES.					
Ancient Briton	7	8	7	....	7
Kittatinny	8	8	6	7	8
Lawton	8	6	5	6	8
Missouri Mammoth	7	8	6	8	8
Snyder	7	8	9	9	8
Stone's Hardy	7	8	9	8	8
Taylor	8	8	8	8	8
Western Triumph	8	8	8	8	6
CURRANTS.					
Black Naples	8	8	9	10	8
Cherry	8	8	9	8	7
Lee's Prolific	8	9	9	10	8
Red Dutch	8	8	9	10	9
Victoria	8	8	9	8	9
La Versaillaise	7	8	9	7	8
White Dutch	6	8	9	8	8
White Grape	6	8	9	8	8
GOOSEBERRIES.					
Downing	8	8	9	8	8
Houghton's Seedling	7	8	9	8	9
Mountain Seedling	6	6	9	7	[illegible]
Smith's Improved	9	9	9	7	7

GARDEN VEGETABLES.

Trials of varieties comprised the greater part of the work in the vegetable garden. This work was undertaken, not merely to ascertain which are the best varieties, but for the purpose of determining synonyms, and of testing the purity and value of the so called strains of varieties offered by different seedsmen. Vegetable nomenclature is in such a confused state that it is a matter of importance to determine what names are synonymous, and in what instances the same name has been applied to different varieties. Our trials show that seed from most sources has a sufficiently high vitality and is comparatively free from mixture, but there are marked differences as to trueness to type and purity of strain. In some cases these differences are as great as between a profitable and an unprofitable crop. In none, except very marked cases, are last season's observations given, as further trials are necessary before percentage of variation can be ascertained

A few samples were so superior and gave evidence of such careful selection that it seems but just to give deserved praise, while a few are worthy of condemnation only.

It should be borne in mind that whatever is said, for or against a variety offered by any seedsman, it argues nothing concerning the other seeds he sells. The object in this work is as much to ascertain who sells good seed as it is to expose those who do not. Such investigations are of equal value to reliable seedsmen and the public. The Station simply undertakes to do what every one who buys seed would do if he could, and what most gardeners do undertake, often incurring thereby considerable losses.

Some seedsmen show confidence in their seeds by sending them for trial, and in one case requesting that the result be made as public as possible.

The severe drouth injured some crops greatly and nearly destroyed others. Irrigation was practiced to some extent, by means of which some crops were greatly benefitted, but not in any case brought to perfection. Underground irrigation was tried on a small scale, by laying a three inch tile two feet below the surface, through a field of late cabbage. The tile was kept constantly full or water and the ground became quite thoroughly soaked to the distance of two feet on either side. The cabbage in the first two rows on either side of the tile was benefitted considerably; the effect upon the next two rows was not marked, while those more remote did not seem to be affected in the least. Upon heavy clay soil, like that of the Station grounds, it would be necessary to lay tile not more than ten feet apart.

BEETS.

Twenty varieties of beets were sown May 2. Because of the drouth the late varieties made such small roots that no report is given. An attempt was made to determine the comparative earliness of the early table varieties, but it is difficult to make satisfactory comparisons of this kind.

All the varieties in the list given were found to have roots of marketable size sixty-eight days from the time of planting. An average of the weights and measurements taken at that time is given in the table. There was a greater number of Egyptian and Eclipse fit to pull, while the Bassano and Early Forcing averaged somewhat larger in size. The difference in earliness is so little in favor of the Egyptian and Eclipse that it is more than counterbalanced by the superior size and appearance of the Bassano and Early Forcing.

TABLE I.—EARLY BEETS.

Name of variety.	Average circumference in inches.	Average weight in ounces.	Remarks.
Bassano	7½	3	Light red; one of the best for market.
Dark Red Egyptian	6½	2¼	Dark red; matures very early; very small top.
Dewing's Blood Turnip	6	2½	Has a bright, attractive appearance.
Early Forcing, Landreth's	7	3	A very excellent variety, with short tops, adapted to forcing.
Early Blood Turnip	6	2	Very similar to Dewing's Blood Turnip.
Eclipse	6½	2½	Very much like the Egyptian.
Early Blood Red Turnip	6½	3	Much like Dewing's Blood Turnip, with perhaps less white.
Pine Apple	6	3	A good variety; roots half long.

CARROTS.

Fourteen varieties of carrot seed were sown May 2. The crop was very small because of the drought, but the yield of each row, eight feet in length,

is given for comparison. The most desirable are the Extra Early F
Danvers, and Half Long. Upon low, moist ground the Danvers gave
of about eight hundred bushels per acre. Its root is comparatively sho
regular, and smooth. For field culture it is probably the best of all.

TABLE II.—CARROTS.

Name of variety.	Yield per row of eight feet.		Remarks.
	lbs.	*oz.*	
Danvers	4	13	Half long, regular, smooth, very des
Dutch Horn	3	5	Very short, almost turnip shape smooth, but small.
English Horn	5	14	Half long, tap root slender, quite ir and rough.
Early Half Long Scarlet	4	3	Half long, tap root slender, rathe and irregular.
Extra Early Forcing	4	4	Very similar to the preceding, and identical.
Early Half Long	5	12	Somewhat longer than the precedin smooth.
Early Half Long Carentan	5	6	Similar to the preceding, but perhap longer.
French Horn	2	12	Half long, nearly egg shape, small ferior.
Half Long	6	8	Resembles Early Half Long Scarlet, haps has been selected with great
Long Scarlet Altringham	1	14	Very long and slender, rather rough
Long Red St. Valery	4	10	Similar to the preceding in shape.
Long White Green Top	6	3	Skin white to yellowish, with gre long, slender and quite regular.
Nante's Early Half Long	4	15	Half long, tap root very slender, bod but very little.
White Large Short Vosges	5	3	Half long, tapers very evenly, very white and of fine appearance; a fi variety.

EARLY CABBAGE.

Twelve varieties of early cabbage were sown in a cold frame March
transplanted into the open ground May 1. The soil was a clay loa
enriched with stable and special cabbage manure. The plants grew
and outstripped those of an earlier sowing, also plants which had been w
over. Nearly all formed heads, many of which would have been of
size but for the drought.

Aside from a trial of varieties, duplicates of several varietis were p from different seedsmen for the purpose of comparison, with especial reference to purity of strain and fixity of type. The number of plants taken, being only ten, was too small to admit an estimate of percentage of variation or of mixture to be given, but some note swere taken, which are given under "Notes on varieties."

The names of seedsmen from which the stock was obtained are given, because no comparison could be made otherwise. No discrimination has been made, and it is believed that the work has been accomplished with fairness toward all. Some unfavorable reports are of necessity given, but seed of the same stock has been kept for another trial, which may give different results. Some samples that appear to be badly mixed, or otherwise faulty, may, upon further trial, make a better showing. On our part special care was taken to prevent mixing of varieties.

TABLE III.—Early Cabbage.

Name of variety.	First date of cutting.	Last date of cutting.	Greatest weight of head.		Average weight of heads.		Greatest circumference of head.	Average circumference of heads.
			lbs.	*oz.*	*lbs.*	*oz.*	*in.*	*in.*
Bloomsdale Early Market (Landreth)	August 18	September 1	7	4	5	13	27	24
Early Deep Head (Gregory)	September 1	" 1	4	4	3	8	25	21
Early Dutch Drumhead (Vilmorin)	July 22	" 1	6	6	4	13	25	22
Early Drumhead, St. John's Day, (Vilmorin)	" 5	" 1	4	8	3	13	25	21
Early Summer (Henderson)	" 18	" 1	5	5	4	4	25	22
Early Summer (Ferry)	" 22	" 1	5	4	3	12	25	21
Early Summer (Livingston)	" 18	" 1	4	9	3	12	23	22
Early Summer (Landreth)	" 25	" 1	3	1	2	5	20	18
Early Etampes (Vilmorin)	" 18	" 1	4	15	3	9	24	20
Early Wakefield (Landreth)	" 22	" 1	3	14	3	7	21	19
Early Wakefield (Ferry)	" 18	August 1	2	11	2	6	20	18
Early Wakefield (Tillinghast)	" 22	September 1	3	14	3	5	23	21
Early Wakefield (Livingston)	" 18	" 1	3	10	3	2	20	19
Early Wakefield (Tillinghast, P. S.)	" 22	" 1	5	12	3	9	29	21
Early Wakefield (Henderson)	" 16	" 1	3	6	2	12	19	18
Early Winningstadt (Henderson)	August 1	" 1	2	15	2	9	18	16
Early Winningstadt (Vilmorin)	July 22	" 1	3	4	2	10	18	17
Fottler's Early Drumhead (Tillinghast)	" 18	" 1	5	8	4	4	27	25
Landreth's Earliest (Landreth)	" 10	" 1	3	5	2	9	21	18
Paris Market (Vilmorin)	" 18	July 25	3	4	2	11	20	18
Premier (Henderson)	" 18	August 1	3	1	2	3	20	17

NOTES ON VARIETIES.

Bloomsdale Early Market (D. Landreth & Sons).—This is a very excellent second early variety, being healthy, vigorous and of very uniform strain. Heads conical to spherical, and extremely solid.

Early Deep Head (J. J. H. Gregory).—This is another good second early sort. Heads flat, solid and very uniform in size, and true to type. The stock has apparently been selected with great care.

Early Dutch Drumhead (Vilmorin & Andrieux).—This resembles Bloomsdale Early Market in form, but is somewhat earlier. Very uniform and true to type.

Early Drumhead, St. John's Day (Vilmorin & Andrieux).—A very early variety, but possesses the fault of cracking open before fully mature. Heads rather larger, but not so solid as Wakefield.

Early Summer.—Seeds of this variety were obtained from Peter Henderson & Co., D. M. Ferry & Co., A. W. Livingston's Sons and D. Landreth & Sons. The plants grown from seed from the first three named firms were remarkably similar every way, as much so as though taken from the same stock, being free from mixture and true to type. Plants grown from seed of the last named firm were not so uniform, a little later, and formed smaller and more nearly spherical heads. Whether it is the same variety is a matter of doubt.

Early Etampes (Vilmorin & Andrieux).—This variety suffered considerably more from drouth than any other. Heads conical, often pointed, leaves yellowish green. About as early and a little larger than Wakefield, and may in some localities be superior to that variety. Very uniform as to type.

Early Wakefield.—Seeds of this variety were obtained from D. Landreth & Sons, D. M. Ferry & Co., Isaac Tillinghast (Puget Sound and Eastern Grown), A. W. Livingston's Sons, and Peter Henderson & Co. All the plants grown from these samples showed more or less variation and mixture. Those from D. M. Ferry & Co. being perhaps the purest of all, but at the same time least satisfactory because of small size and tendency to rot. Those from Landreth seemed to be mixed with Bloomsdale Early Market; those from Livingston and Henderson with Early Summer; while those from Tillinghast departed very widely from the true type. The Eastern grown seed from this firm was much like that obtained from other sources, but the Puget Sound seed was mainly of a larger, later strain, giving only one typical Wakefield head from the ten plants. This variety, whatever it may be, is really a very good second early sort, resembling Bloomsdale Early Market and Early Dutch Drumhead.

Only two heads of this variety were ready to cut previous to September 1, at which time nearly all of Early Deep Head, Early Dutch Drumhead, Bloomsdale Early Market, and Fottler's Early Drumhead were also cut. The Early Wakefield is one of the best early varieties of cabbage and would well repay greater care in selection and weeding out of such forms as depart from the true type. This work seems not to have been done so thoroughly with the Wakefield as with some other varieties. One gardener alone reports a loss of five hundred dollars, the past season, because the seed procured for Early Wakefield proved to be largely mixed with a later variety.

Early Winningstadt (Peter Henderson & Co.)—Proved to be very pure and true to type. The same may be said of seed of this variety obtained from Vilmorin, Andrieux & Co.

Fottler's Early Drumhead (Tillinghast).—This is a very good second early variety, resembling Early Deep Head. Matures at about the same time as the other second early varieties.

Landreth's Earliest (D. Landreth & Sons).—Resembles Early Etampes very closely, although some of the plants had more of the appearance of Early Wakefield, while others were of an unknown variety. Doubtless, when pure, this is a very valuable early sort. A part of the mixing may have occurred accidentally when the seed was sown, but not all; for some unknown varieties appeared. Sufficient of the seed is reserved for another trial.

Paris Market (Vilmorin & Andrieux).—Resembles Early Etampes, but may not be identical. The drouth affected it considerably, which was true of all foreign varieties.

Premier (Peter Henderson & Co.)—This variety closely resembles Early Etampes every way and may prove to be identical. It does not appear to be at all superior to that variety.

LATE CABBAGE.

Twenty-four varieties of late cabbage were sown May 20 and transplanted June 20. A good stand was secured and the plants grew firmly until checked by the drouth. Irrigation was resorted to, but the plants became so infested with lice that many of them were badly perished, and formed very poor heads in consequence.

The notes given in the table will serve for a comparison of varieties, but the record of any particular variety can not be taken as an index of its capabilities in a more favorable season. The number of plants of each variety was too small to render it possible to determine synonyms, or to give the percentage of variation and mixture. In some instances, however, it was possible to form a close estimate as to purity and trueness to type, as some of the varieties were grown in considerable quantities, and in others the characteristics were so marked as to be very noticeable.

TABLE IV.—Late Cabbage.

Name of variety.	First date of cutting.	Last date of cutting.	Greatest weight of head.		Average weight of heads.		Greatest circumference of head.	Average circumference of heads.
			lbs.	*oz.*	*lbs.*	*oz.*	*in.*	*in.*
Bloomsdale Large Late Flat Dutch (Landreth)	October 20	November 14	7	1	6	3	33	30
Bridgeport Late Drumhead (Livingston)	November 14	“ 14	6	0	3	3	34	31
Chase's Excelsior (Livingston)	October 20	October 20	8	14	6	9	37	33
Drumhead St. Dennis (Vilmorin)	“ 20	November 14	3	7	2	12	27	22
Drumhead Large Brunswick (Vilmorin)	November 14	“ 14	2	14	2	5	....	.....
Drumhead Flat Dutch (Vilmorin)	October 20	“ 14	5	8	4	7	29	27
Dark Red Drumhead (Vilmorin)	November 14	“ 14	2	12	2	0	22	20
Excelsior Flat Dutch (Harris)	October 20	“ 14	6	1	3	15	33	28
Excelsior Late Flat Dutch (Tillinghast) P. S.	“ 20	“ 14	6	2	5	7	34	32
Excelsior Late Flat Dutch (Tillinghast) E. G.	“ 20	October 20	2	14	2	12	26	23
Large Lace Mountain (Landreth)	November 14	November 14	6	2	5	6	30	30
Large Drumhead (Livingston)	October 20	“ 14	5	12	4	1	33	28
Marblehead Mammoth Drumhead (Gregory)	November 14	“ 14	3	12	3	8	30	29
Marblehead Mammoth Drumhead (Livingston)	“ 14	“ 14	5	2	3	9	29	26
Marblehead Mammoth Drumhead (Ferry)	“ 14	“ 14	7	8	4	0	34	28
Marblehead Mammoth Drumhead (Henderson)	“ 14	“ 14	5	8	4	0	33	29
Premium Large Drumhead (Ferry)	“ 14	“ 14	6	3	3	7	34	25
Premium Flat Dutch (Livingston)	“ 1	“ 14	5	9	4	5	33	31
Premium Flat Dutch (Tillinghast) P. S.	“ 14	“ 14	7	0	4	6	34	30
Premium Flat Dutch (Ferry)	October 20	“ 14	7	8	5	2	34	30
Premium Flat Dutch (Harris)	“ 20	“ 14	6	0	5	3	36	33
Premium Flat Dutch (Tillinghast) E. G.	“ 20	“ 14	5	14	5	2	33	30
Premium Flat Dutch (Gregory)	November 14	“ 14	6	8	5	0	34	30
Selected Late Flat Dutch (Henderson)	October 20	“ 14	7	8	6	7	35	32

Bloomsdale Large Late Flat Dutch (D. Landreth & Sons).—An excellent s of this valuable variety, although it seems to depart considerably from wl usually taken as the typical form of Flat Dutch, having a comparatively stem and nearly spherical heads. But few heads were fit to cut previo November 14. Very uniform as to type.

Bridgeport Late Drumhead (A. W. Livingston's Sons).—A very good comparatively late variety. Quite uniform and pure.

Chase's Excelsior (A. W. Livingston's Sons).—This is apparently a choice strain of Early Flat Dutch. It is very uniform as to type, comparat early and sure to head. Altogether, this variety seems to be very promi and should it sustain itself on further trial it will take rank as one of the best.

Drumhead St. Dennis' (Vilmorin & Andrieux).—None of the late vari received from Europe grew well here. They suffered greatly from dr formed very loose light heads, and rotted badly. All the seed received Vilmorin & Andrieux was, as far as could be determined, very pure and to name.

Excelsior Flat Dutch (Joseph Harris) —Quite true to type, but not so go the Premium Flat Dutch from the same source.

Excelsior Flat Dutch, Puget Sound seed (Tillinghast).—This proved to very good strain, uniform and quite true to type. The same variety fro same source, labeled "Eastern Grown," gave very poor results, showin aracteristics of European seed.

Large Late Mountain (D. Landreth & Sons) —A very good late va although apparently much like Marblehead Drumhead.

Large Drumhead, *Marblehead Mammoth Drumhead* and *Premium Drumhead* from several different seedsmen are very similar, although pe not indentical. None of them formed solid heads, and many plants form heads at all, consequently no report can be made, except the few notes in the table.

Premium Flat Dutch (A. W. Livingston's Sons).—This is a long ster strain of Flat Ducth, and showed considerable variation. Not so desirab as Chase's Excelsior from the same source.

Premium Flat Dutch (Isaac Tillinghast).—Comparative pure and tr type, showing but little variation.

Premium Flat Dutch (D. M. Ferry & Co).—This is also of the long stem strain, but comparatively true, showing only a small percentage of variatio

Premium Flat Dutch (Joseph Harris).—This is a very fine strain of stemmed Flat Dutch, quite pure and true to type. Apparently much b than the Excelsior Flat Dutch from the same source. It is earlier and more desirable every way than any of the long stemmed strains.

Premium Flat Dutch Eastern Grown (Tillinghast). This is much better than the Excelsior Flat Dutch from the same source, being of the short stemmed type, quite true and good, except that the heads were comparatively soft.

Premium Flat Dutch (J. J. H. Gregory).—This is a comparatively good strain of the long stemmed type, but like all the others of this class, is rather late and shows need of more careful selection.

Selected Late Flat Dutch (Peter Henderson & Co).—This is a very choice strain of short stemmed Flat Dutch, and is almost perfect, so far as purity and trueness to type are concerned. In a field of several thousand plants there was apparently not one but would have formed a solid head in a favorable season.

SWEET CORN.

Sixteen varieties of sweet corn were planted May 26th. The most important notes are given in the table below.

Early Marblehead is the best very early variety, followed closely by Extra Early Dwarf Sugar and Ford's Early. The last named variety is of much better quality than the Marblehead. Extra Early Tom Thumb and Early Narragansett have few qualities to recommend them. Of the second early varieties the New Triumph is especially desirable. Amber Cream, Early Genesee, Excelsior, Landreth's Sugar and Moore's Early Concord are all good varieties. Crosby's Early is lacking in quality. Egyptian is one of the best late sorts. Ford's Improved resembles the Egyptian greatly. Livington's Evergreen is an excellent variety. The length of ears and height of stalks are given as an average of measurements taken last season.

TABLE V.—SWEET CORN.

Name of variety.	Ready for use.	Ripe.	Average length of ear. *Inches.*
Amber Cream	August 13	September 10	7
Crosby's Early	“ 13	“ 10	6
Early Genesee	“ 13	“ 8	7
Extra Early Dwarf Sugar	“ 1	August 22	6
Extra Early Tom Thumb	“ 1	“ 22	5
Egyptian	“ 22	September 15	7
Excelsior	“ 13	“ 10	7
Early Narragansett	July 28	August 22	5
Early Marblehead	“ 25	“ 20	6
Ford's Improved	August 22	September 15	8
Ford's	“ 1	August 22	6
Landreth's Sugar	“ 20	September 15	7
Livingston's Evergreen	“ 20	“ 18	7
Moore's Early Concord	“ 13	“ 10	6
New Triumph	“ 20	“ 10	7
Pee & Kay	“ 7	“ 10	7

ONIONS.

The experiments with onions consisted in a trial of fertilizers, thick and thin seeding, and of seed from different sources.

The crop suffered greatly from drouth, giving not more than one-fourth of an average yield. No effect was apparent where fertilizers were used, except with well rotted horse manure, and even there the gain in yield was slight. The yield of unfertilized plots was fully equal in all other cases to the yield of those that were fertilized, and the variation among the plots was quite as marked.

A series of plots was devoted to thick and thin seeding. The seed was sown quite thickly, and as soon as fairly up the plants were thinned to one, two, three, and four inches apart. Duplicate trials were made, and the results were the same in all cases.

Thick seeding gave the largest yield, in weight, but the onions were much smaller. The plots contained six rows, each six feet in length—the same size as all the other plots. Yellow Danvers was the variety used.

Distance apart in the row.	Yield.	
	lbs.	*oz.*
One inch	13	2
Two inches	11	7
Three inches	9	
Four inches	8	

Seed of Yellow Danvers was obtained from twelve different seedmen, and growers, and treated in precisely the same manner. The trials were in all cases duplicated. There was a considerable difference in earliness, as well as in quality and yield.

But few scullions were found upon any of the plots.

The best onions, as to form, were found upon the plots which gave the largest yields, which seems to indicate that greater differences would have been observed in a more favorable season. It is hardly safe, however, to form general conclusions from one season's trial, especially from an unfavorable one like the past.

TABLE VI.—ONIONS.

Source.	Date of ripening.	Weight of product.		Remarks.
		lbs.	*oz.*	
D. M. Ferry & Co.	Aug. 26	9	10	Fine in form; a few
J. A. Everitt & Co	Aug. 26	7	13	Fair; a few red onio
J. J. L. Green	Sept. 18	12	9	Very fine and pure.
J. H. Gregory	Aug. 26	6	8	Fair; a few red onio
Joseph Harris	Sept. 18	7	12	Quite pure.
Peter Henderson & Co	Aug. 26	6	8	Good; a few red oni
I. E. Jones	Sept. 18	10	9	Fine in form and pu
A. W. Livingston's Sons	Sept. 18	8	12	Good; quite pure.
D. Landreth & Sons	Aug. 26	7	1	Quite pure.
Same, Conn. grown	Aug. 26	9	4	Fair; a few red onio
Same, Cal. grown	Aug. 26	9	6	Fair; a few red onio
James Vick	Sept. 18	8	12	Good; true.
Vilmorin, Andrieux & Co	Aug. 26	6	8	Good; a few red onic

PEAS.

Peas were sown May 2. The seed was placed in drills three inche and about three inches apart. The rows were three feet apart and o long. Pickings were made from twenty-five plants of each variety, th and peas counted and weighed. This method gives a fair comparison the number of pickings and length of time in bearing, and doubtless als productiveness.

Table VII shows the comparative earliness and number of days in be it also shows the number of pickings, and when each variety was at its Such varieties as American Wonder, Tom Thumb, Premium Gem Minimum are not fairly represented, because, after apparently done be a new growth commenced, and a second crop, although small, could been gathered.

TABLE VII.—Peas, Comparative Earliness.

Name of variety.	First edible peas, days from planting.	Number of pods first picking.	Number of pods second picking.	Number of pods third picking.	Number of pods fourth picking.	Number of days in bearing.
American Wonder	49	9	71	....	....	10
Bliss' American Racer	57	85	69	....	....	15
Bliss' Everbearing	62	140	90	....	....	....
Bliss' Abundance	52	19	68	126	51	22
Bishop's Dwarf Prolific	64	68	142	22	....	20
Cleveland's Rural New Yorker	49	32	119	45	....	10
Culverwell's Telegraph	62	125	35	....	....	12
D. M. Ferry & Co.'s Extra Early	47	23	86	3	....	10
Extra Early Premium Gem	49	25	53	29	....	10
Everitt's Extra Early Reliance	47	44	53	19	....	10
Early Kent	57	138	225	22	....	17
Ferry's First and Best	47	50	45	4	....	10
Hancock	49	28	106	47	....	10
Henderson's First of All	47	53	40	2	....	10
Horsford's Market Garden	57	30	170	170	82	17
Landreth's Extra Early	47	50	72	1	....	10
Laxton's Marvel	55	50	40	....	....	19
Laxton's Surprise	64	43	72	....	....	10
Livingston's First in the Market	47	51	34	4	....	10
Minimum	52	134	80	....	....	8
Pride of the Market	62	67	71	....	....	12
Racket	52	17	56	173	49	22
Royal Dwarf Marrow	64	53	124	80	....	12
Sibley's First and Best	49	22	85	75	....	8
Stratagem	62	82	67	....	....	12
Tom Thumb	49	10	75	....	....	8
Telephone	57	22	55	24	....	17
Thorburn's First and Best	49	20	89	39	....	10

Table VIII shows the comparative productiveness, the average number of peas per plant, and the relative weight of peas and pods. It must be remembered, however, that varieties vary greatly in different seasons and upon different soils. The signs plus (+) or minus (—) are placed after the number of peas in a pod to indicate that the average is slightly above or slightly below the number given.

The proper standard of comparison is not in the whole number of pods and peas, but in the relative weight of peas and pods, and in the gross weight of peas. The yield would have been much higher per plant had the vines been given more room.

TABLE VIII.—PEAS, COMPARATIVE PRODUCTIVENESS.

Name of variety.	Number of pods from 25 plants.	Number of peas from 25 plants.	Average number of peas per pod.	Weight, in ounces, of whole number of pods.
American Wonder	150	580	4—	18
Bliss' American Racer	154	621	4+	12¾
Bliss' Everbearing	230	660	3—	29¾
Bliss' Abundance	264	1,031	4—	32
Bishop's Dwarf Prolific	232	796	3+	23
Cleveland's Rural New Yorker	196	864	5—	23
Culverwell's Telegraph	160	750	5—	36
D. M. Ferry & Co.'s Extra Early	112	397	4—	12½
Extra Early Premium Gem	139	580	4+	16
Everitts Extra Early Reliance	115	499	4+	14
Early Kent	385	1,601	4+	32½
Ferry's First and Best	99	443	4+	11¾
Hancock	181	926	5+	22½
Henderson's First of All	95	426	4+	12⅝
Horsford's Market Garden	452	1,826	4+	59¾
Landreth's Extra Early	123	558	4+	14½
Laxton's Marvel	90	374	4+	12½
Laxton's Surprise	115	356	3+	13
Livingston's First in the Market	89	435	5—	11½
Minimum	255	1,140	4+	25¾
Pride of the Market	138	616	4+	30
Racket	295	1,254	4+	33¼
Royal Dwarf Marrow	257	1,019	4—	44
Sibley's First and Best	182	779	4+	24
Stratagem	149	414	3—	18¼
Tom Thumb	110	515	5—	13¼
Telephone	101	437	4+	21¼
Thorburn's First and Best	148	598	4+	18⅛

SYNONYMS.

Five so-called varieties are very nearly identical, as shown in the following comparison:

Name of variety.	First edible peas—days from planting.	No. of days in bearing.	No. of pods per 100 plants.	Average No. peas per pod.	Height of vine.
D. M. Ferry & Co.'s First and Best......	47	10	396	4+	20 to 24 in.
Everitt's Extra Early Reliance	47	10	560	4+	20 to 24 in.
Henderson's First of All........................	47	10	380	4+	18 to 20 in.
Landreth's Extra Early........................	47	10	492	4+	20 to 24 in.
Livingston's First in the Market...........	47	10	396	5—	20 to 24 in.

The following comparison is from the Second Annual Report of the New York Experiment Station:

Variety.	Planted.	Vegetated.	Bloomed.	First edible maturity.	Last edible maturity.	First ripe seed.	Last ripe seed.
Cleveland's First and Best	May 12	May 25	June 15	June 30	July 10	July 14	July 26
Ferry's First and Best	May 12	May 25	June 15	July 1	July 12	July 16	July 26
Sibley's First and Best	May 12	May 25	June 16	June 30	July 10	July 14	July 25
Thorburn's First and Best	May 12	May 25	June 15	June 27	July 12	July 14	July 26
Henderson's First of All........................	May 12	May 25	June 16	July 1	July 10	July 14	July 26
Hancock	May 12	May 25	June 15	June 30	July 10	July 14	July 27
Philadelphia Extra Early	May 12	May 25	June 15	June 30	July 11	July 14	July 26

Evidently there are nine names in the above lists that are unnecessary. Perhaps some of these so called varieties show somewhat less tendency to variation than others, indicating greater care in growing the stock, but in no case is there such superiority as is claimed by the disseminators.

TOMATOES.

The experiments with tomatoes consisted in a trial of varieties, inc the newer ones that could be obtained, and many of the old sorts for ison. The trial of early and late selected seed was also continu Acme and Perfection were the only varieties used. Last season showed a decided gain in favor of seed taken from the earliest ripen but the Perfection showed no gain. This season the Acme showed greater gain, but as an accident occurred which renders the result uncertain, the figures are not given. A sufficient quantity of the saved for another trial. The Perfection this season shows a consider in favor of seed from the earliest fruit.

In both instances the finest fruit was from early selected seed. In of varieties the date of ripening means the time when the first ripe found. This does not, however, in all cases show the comparative for a variety may have only one or two ripe fruits, while another several. Some remarks bearing upon this will be found in " Varieties."

A considerable number of specimens were weighed and measured, weighed, and cells counted. The average results are given in the comparison. The size and weight, of course, vary greatly with the season, and the figures should be considered as merely relative.

TABLE IX.—TOMATOES.

Name of variety.	Date of first ripe fruit.		Average circumference of fruit—inches.	Average weight of fruit—ounces.	Per cent. of seeds and pulp.
Acme	July	23	9	6	27
Alpha (Gregory)	"	21	9	4	33
Alpha (Ford)	"	18	8	3½	33
Canada Victor (Gregory)	"	21	8	6	26
Cardinal (Henderson)	Aug.	1	9	6	24
Early Dwarf Red (Vilmorin)	July	25	7	5	28
Early Conqueror (Ferry)	"	25	8	4	32
Essex Hybrid	"	25	7	5	30
Early Smooth Red (Vilmorin)	Aug.	4	9	6	28
Favorite (Livingston)	July	28	10	7	27
Favorite (Ferry)	Aug.	1	10	7	....
Golden Queen	"	4	10	10	32
Hathaway's Excelsior (Henderson)	July	25	8	4	33

TABLE IX.—TOMATOES.—Continued.

Name of variety.	Date of first ripe fruit.	Average circumference of fruit—inches.	Average weight of fruit—ounces.	Per cent. of seeds and pulp.	Average number of cells.
Hathaway's Excelsior (Livingston)	July 28	7	4	33	5
Hundred Day (Ferry)	" 25	7	4	30	10
Island Beauty	" 27	8	6	30	10
King Humbert (Bliss)	" 25	4	2	15	2
Mayflower	" 25	8	5	29	6
New Red Apple	" 28	9	6	26	5
Perfection (Livingston)	" 23	9	6	23	6
Perfection (Landreth)	" 21	8	4	....	....
Paragon (Landreth)	" 25	8	4	34	7
Paragon (Livingston)	Aug. 1	10	6	30	7
Rural	July 18	8	5	....	....
Rochester (Gregory)	" 26	10	7	26	9
Trophy (Livingston)	Aug. 1	12	7	25	10
Trophy (Vilmorin)	July 28	10	6	25	10
Upright Red (Vilmorin)	Aug. 11	8	4	....	....

NOTES ON VARIETIES.

Acme.—This variety has the reputation of rotting badly, but it has not shown that tendency the past season to any greater extent than many other varieties. It is the earliest of the large varieties; the early kinds being much inferior to it, and the later ones but little, if any superior.

Alpha.—Although very early, this variety is too small and irregular to be of any value, only a small quantity of the fruit being marketable. Extra selected seed from Frank Ford proved to be better than from other sources, showing that the variety is susceptible of improvement.

Canada Victor.—This variety is perhaps superior to the Alpha, being rather larger and more regular. Extra selected seed from Gregory, showed the effect of careful selection, but at best this variety is inferior to several others only a few days later.

Cardinal.—This is a very fine second early variety, being smooth, of good size and color. As will be seen by reference to the table, it has a small number of cells and comparatively little pulp and seed. It has the fault, however, of rotting quite badly, and occasionally a fruit very much like the Acme appears, showing that selection has not been carried far enough.

Early Dwarf Red.—Probably identical with Hubbard's Curled Leaf.

Early Conqueror.—This variety has no especial merit, being quite ir and having a comparatively large quantity of seeds and pulp.

Essex Hybrid.—Very much like the Acme, at least not superior variety. It rots quite badly and shows some tendency to vary. whole, it does not fulfill expectation.

Favorite.—A few days later than the Acme, very large, smooth, and every way.

Golden Queen.—Somewhat sweeter than most of the red varieties. a fine, large, smooth variety, its only fault being its color.

Hundred Day.—Fruit very rough and irregular. A variety of no merit.

Island Beauty.—Some of the fruit was smooth and fine, but a large age was irregular.

King Humbert.—The fruit is small, but quite smooth and uniform in s of good quality. It has a remarkably small amount of seed and pulp is undoubtedly a good variety for home use, but may not become pop the market.

Mayflower.—Rotted very badly, much worse than any other variety fruit was quite uneven in size and irregular. We procured seed from o source and it may not have been grown with sufficient care. This varie unusual promise in 1883.

New Red Apple.—This variety resembles the Perfection, but is not so and was affected more by the rot. The largest specimens are quite ir

Perfection.—This variety rotted quite as badly as the Acme. Seed own growing and that procured from the originator gave much better than that from any other source. Fruit of this, and other varieties also, from Eastern seed, rotted much worse than that from home grown seed

Rural New Yorker (selected seed).—This comprises several variet gave some fine specimens, but none distinct from well known sorts.

Rochester.—Seed of this variety was procured from the same source Mayflower, but was mixed so badly that no report can be given.

Upright Red.—The plants grow in a bush form. This is offered b seedsmen as the Tree Tomato. It is quite late, fruit irregular, but size. It seems to possess no especial merit.

REPORT ON INSECTS.

The Station in former reports has given a brief description of the natural history of the most formidable of our insect enemies, together with the best known remedies for the prevention of their injuries. In this report an effort will be made to classify the most practicable remedies and give some notes in regard to the best manner of applying the same.

The destruction of our insect foes means work. No patent nostrum or magical art will keep them in check. This can only be accomplished by an earnest, painstaking, united effort on the part ot all who suffer from their depredations.

Many of the so called "Insect Exterminators" are swindles. Some proposed remedies are wholly impracticable, and are mentioned simply to call attention to their defects. Only such are recommended as observation and repeated experiment have found useful. The main object of this report is suggestion. If it should induce those who suffer from insect pests to put forth an extra effort and test some of the remedies here recommended, it will prove of no slight service to the State.

WHAT CONSTITUTES A PRACTICAL REMEDY.

The essential requisites of a practical remedy for insect pests are as follows:

1. *It must be effectual.*—That is, it must either kill or repel the insects against which it is used.

2. *It mnst be harmless to the plants to which it is applied and to those that use them.*—Some of the best insecticides are active poisons. These are often applied to the food plants of insects. If they injure the plant, as well as destroy or repel the insect, or poison those who use the plant, or some part of of it, the remedy is impracticable.

3. *It must be of moderate cost.*—A remedy may be *effectual* and *harmless*, yet if it costs as much or more than the crop it is designed to protect is worth, it is not practicable.

4. *It must be of easy application.*—A remedy that is so complicated that it cannot be readily prepared, or one that requires over much attention in its

application, is not likely to be properly used and is, therefore, unreliable and impracticable.

Any remedy that will stand the test of the above requirements can be commended and used with equal safety and profit.

GENERAL DIVISION OF REMEDIES.

All remedies for noxious insects may be divided into two classes, viz.: 1. *Preventive measures.* 2. *Remedial measures.* All means that repel or drive away insects, thus precluding injury, belong to the first division. All means employed to kill the insect in some of its stages belong to the second division. The various remedies that come under each of these two divisions may be classified as follows:

I. PREVENTIVE MEASURES.

1. *Increasing the vigor of plants, thereby enabling them to resist insect attacks.* It may be safely asserted that insects rarely attack plants that are in perfect health. The very best preventive against insect enemies is to keep all plants in a healthy, vigorous condition. To accomplish this there must be thorough culture and a liberal use of fertilizers.

Careful selection of seed, and a judicious rotation of crops will also tend to secure the same end. Bad culture, the exhaustion of the soil, careless selection and preservation of seed, the severities of our climate, all tend to make plants weak and unhealthy, thus rendering them susceptible to the ravages of insects. It must not be understood that the devastation by insects would wholly cease if all our plants were in a normally healthy condition, but observations made at the Station go to show that at least one-half of the losses by insects would be precluded if our plants possessed a full measure of vigor.

2. *By varying the time and place of planting, or postponing the cultivation of crops for one or two years.* Delaying the sowing of wheat for a few weeks has frequently saved the crop from the Hessian fly. See notes on "Early and Late Sowing," under Wheat Experiments.

A judicious rotation of crops has been found very effective in warding off the attacks of noxious insects. This appears to be the only practicable method of dealing with the corn root worm (*Diabrotica longicornis*, Say.) for the eggs of this pest remain in the ground over winter, hatching soon after the corn is planted. According to Prof. Forbes this insect attacks sorghum or broom-corn, hence these crops should not follow one of corn that had been badly infested. The rotation of wheat checks the ravages of the Hessian fly. Nearly all crops liable to be infested by the different species of insects that prey upon the roots, or are injured by underground larvæ, are benefitted by a rotation. By this means they not only escape infested ground, but the plants are usually rendered more healthy and vigorous.

In localities badly infested with the pea or bean weevil the best remedy is to refrain from planting these crops for one or two years. If there could be concerted action this remedy would be effectual.

3. *Making use of some impassable barrier or obstruction.*—Surrounding trees near the base with a strip of coarse paper, and smearing around this a circle of tar, is a good remedy for the canker-worm. The paper band should be about eight inches wide, and tacked around the tree close to the ground. These bands must be applied as soon as the moths appear in the spring, and the tar must be renewed as rapidly as it dries. Cheap molasses and printer's ink may be substituted for tar, although the former is probably the best substance that can be used.

In small gardens plants may be protected from the cut worm by wrapping the stems with paper,at the time of transplanting.

Another practicable obstruction is the mounding of the base of peach-trees with soil or ashes to prevent the borer from depositing its eggs. Small, bottomless boxes covered with glass or mosquito-netting and placed over cucumber and squash-vines form an effective preventive remedy for the striped cucumber bettle.

4. *Applying some agent that renders the plant or the vicinity in which it grows obnoxious to the insect.*—By far the largest number of preventive remedies come under this head. The following are among the most practicable:

Washing the trunks and larger limbs of fruit or ornamental trees with soft soap or lye to prevent the apple-tree borers, both round and flat-headed, from depositing their eggs. When rightly applied this is an effectual remedy for that pest of apple-culturists, the old apple tree borer. The Director is acquainted with an orchard of one hundred and fifty apple trees, now twenty-six years old, that has been regularly and systematically treated to a wash of soft soap about the 20th of May, and again the 20th of June, each year. Less than half a dozen borers have been found in this orchard, and the trees are all in a thrifty, vigorous condition. In neighboring orchards where this precaution was not taken, the trees, have been killed by scores, while many that remain are so much injured as to be worthless. Lye is sometimes used in the place of soap, but the latter is a much more effective preventive. It can be readily applied with an old broom. Beside making the tree obnoxious to the borer, the soap keeps the bark in a healthy condition. This remedy may be applied to all trees or shrubs liable to be attacked by borers.

Spraying, sprinkling or showering plants with a solution of whale oil soap, is one of the very best preventives for quite a number of insect pests. Several years trial has fully demonstrated its value.

To protect house plants from the red spider and aphis or green fly, n is better than a solution of whale oil soap, one-quarter pound to two g of water.

It is also a good remedy for the cabbage worm, and may be employ protect fruit trees from the codling moth and curculio.

For this latter purpose a strong, putrid solution should be showered the trees immediately after the period of blooming. To be effectual, a tion must be repeated, the frequency depending upon the number and ity of the rain-storms.

Tobacco water has been used with excellent effect, as a preventive me Washing plants that are subject to insects in a mild solution of tobacc kept them entirely free. Besides acting as a preventive, tobacco fr poisonous nature, acts as an insecticide.

Fresh gas lime takes high rank as a protective agent in fighting insec must be used with care for it often poisons plants as well as repels i A thin coating scattered on the ground among currant and gooseberry b under plum and apple trees, has proved very serviceable in repelling th rant worm, curculio and codling moth.

Repeated tests by the officers of the Station and others have fully d strated its value. In regard to its value as a direct poison we are una speak from experience.

Gas lime is the refuse product in the manufacture of illuminating g consists of lime which is used as a purifying agent, and as such tak sulphur and other impurities. After being exposed to the air for some it loses its poisonous properties, and has more or less fertilizing value.

Besides the above mentioned preventives, a solution of carbolic acid sene, coal tar, turpentine, napthaline, camphor water, iodine or br water, bisulphide of carbon, decoctions of tansy, eupatorium or bon mayweed and chamomile, knot grass or smart-weed, have been used good effect. Almost any strong smelling substance or bitter infusion wil away insects.

Soot, ashes, lime, fine dust of almost any description, are valuable for protecting plants from egg-deposits. Prof. Lintner believes that so the agents named do not act as direct "repellants," but by their odor c the plant, or prevent its recognition by the enemy. Whether this v correct or not, it is well known that these substances are among our effective means of preventing insect injuries.

II. REMEDIAL MEASURES.

Under this heading may be grouped all those methods of insect wa whose aim is to kill or destroy the insect in some of its stages. In instances some natural habit of the insect furnishes the key to the most practicable remedy. The more common and best means employed for the direct destruction of insects will be briefly treated under the following heads:

1. *Applying poison to the food plant.*—Paris green, London purple, and Hellebore are the best known and most efficient insect food poisons. Nearly all insects that feed upon the foliage or green parts of plants may be destroyed by applying some one of the above named poisons to the plant, or that part of it which they eat. The insect may be in the perfect stage, or it may be in the larval form, when it receives the common name of caterpillar, slug, etc. As a rule, it is in this latter stage that insects do their greatest injury. They are then the most voracious, and are more likely to freely partake of the poisoned food. For all such insects, therefore, we have only to name the best and cheapest poison, and the simplest and most effective means of applying it. The arsenical poisons, Paris green and London purple, are very effective when properly applied, and are among the most common insecticides. With proper precaution they can be used with perfect safety. These poisons should never be used upon plants, the leaves or fruit of which are soon to be used as food. Upon cabbages or plants of that-character, where the poison is not likely to be washed away, they should never be applied.

Care should be taken to keep the poison out of the reach of stock and poultry. Calves have frequently been killed by eating poisoned plants and chickens poisoned insects.

Do not make the mistake of applying these poisons in too great strength. Bear in mind that their use is to poison the food of the insect. If used too strong they not only injure the plants, but are less likely to destroy the enemy.

In regard to the method of application, the results of the Station tests have been that the dry form, or powder, is best for a wet season or showery weather, and a wet mixture the best for a dry season. Mixed with plaster or gypsum, in the proportion of one pound to one hundred, or with flour in the proportion of one pound to forty, has given good satisfaction. With water, one tablespoonful of the poison should be used for every four gallons.

Besides the potato-beetle, these poisons have been used with good effect upon the food plants of the flea-beetle, the canker-worm, and other leaf-eating caterpillars, beetles and their larvæ.

Next to Paris green, perhaps, the best known insecticide is white hellebore. This has been used for many years as a remedy for the currant-worm, and may be regarded as a specific for this pest. It is the powdered root of the *veratrum album*, a plant belonging to the lily family, commonly called white hellebore. It is either used as a dry powder, or is mixed with water. Besides acting as a poison to the foot plant, hellebore also kills by contact. We have used it with good effect as a remedy for the rose slug. Two or three tablespoonfuls stirred in eight quarts of mild soap suds, carefully sprinkled or sprayed over the bushes three or four times at intervals of two weeks, has kept this pest completely in check.

2. *Applying substances directly to the body of the insect.*—Many of our most noxious insects do not eat the tissue of plants, but work their injury by simply sucking the juices. To destroy these pests some direct external application is necessary. Among the best appliances for accomplishing this end are the following: Kerosene emulsion, carbolic acid, bisulphide of carbon, pyrethrum or "buhach," paraffine oil, tobacco water, copperas water, lime water, a weak solution of blue vitrol, hot water, gas lime, air slaked lime, soot, wood ashes, salt water. Other agents have been recommended, but we are not sufficiently acquainted with their merits to pronounce judgment upon them. Among the insecticides mentioned above, one of the cheapest and most efficient for direct applcation is kerosene, or coal oil. It is certain death to insects in all stages, but must be used with great care, or else injury to the plant will follow. Carefully conducted experiments are teaching us the best method of using this and other oils without detriment to the plant.

The difficulty of mixing oils and water, and thus cheaply and easily diluting them, has long stood in the way of their use. This can now be done by the use of soap or milk. We have used the following with very satisfactory results: One pound of hard soap dissolved in ten quarts of warm water, then add one pint of kerosene, shaking or stirring the mixture very thoroughly. Prof. A. J. Cook has found soft soap very efficient. He recommends one quart of soft soap and two gallons of water, heated to the boiling point, and then stirring in one pint of kerosene. Diluted in this way, this deadly agent can be used without any harm to plants of usual hardiness. For all kinds of scale insects, plant lice, etc., this is one of the best remedies. Kerosene can often be used with good effect where it is not necessary to apply it to plants.

Stables or henneries infested with vermin can be effectually cleared of these pests by thoroughly sprinkling or spraying with kerosene. It may be successfully used to destroy lice upon cattle or horses by simply dipping a card or brush lightly in the oil and using it upon the affected parts.

Rags or cloths placed near the hills of cucumbers and squashes, and moistened from time to time with kerosene, is an excellent protective of these plants from their troublesome enemies. By applying the kerosene to the inner folds of the cloths used the oil does not evaporate so readily and needs renewing less frequently.

The history, preparation, and use of various forms of Pyrethrum have been fully described by Prof. Riley. Among a host of agents tested, it has proved the best remedy for the cabbage worm. It was used in the form of a powder and also in solution. Used as a powder, it should be mixed with twenty parts of flour, (buckwheat is preferable) or with an equal number of parts of gypsum or land plaster. Used with water, one large tablespoonful for twelve quarts. For some other insects the mixtures must be somewhat stronger.

3. *To hand pick, entrap, or kill by miscellaneous means.*—For many insects hand picking is the most practicable remedy that can be employed. The egg clusters of the apple tree tent caterpillar can be easily collected and burned any time during the winter. By devoting a few moments a day we saved, by hand picking in early morning, a fine collection of rose bushes from the ravages of the rose bug, and do not hesitate to pronounce it at times a practicable remedy.

The application of soft soap, recommended for the round headed apple tree borer, should always be supplemented by cutting out or killing the borers in their burrows by means of a bent wire. The flat headed apple tree borer and the peach tree borer should always be cut out when discovered.

Fallen fruit should be scrupulously picked up and destroyed when known to contain the larvæ of the coddling moth or curculio. This work may sometimes be done by using pigs or sheep for the purpose. Young chickens may often be cooped in gardens and used to destroy many injurious insects.

Insectivorous birds may be encouraged by planting evergreens and putting up bird houses in the vicinity of the fruit and vegetable garden. Toads should also be protected and encouraged to remain in gardens. We keep them in the green-house over winter and find them excellent allies in destroying insects.

The larvæ of the codling moth may be trapped by placing paper bands three or four inches wide about apple trees, midway between the ground and first branches, and secured either by tacks or by tying a cord tightly around the center. These bands should be applied at the time of the first ripening of the Wilson strawberry and then examined carefully once a week until September 1.

Many night feeding insects may be entrapped under chips or pieces of shingle. This is a good method for destroying the squash bug, curculio, cutworms, etc.

Wire worms may be captured in great numbers by using slices of potato. Cover these slightly with soil and examine daily.

Dry bran or meal moistened with sweetened water or molasses and made into balls are excellent traps for these pests.

One of the best traps for ants is to use a sponge saturated with sweetened water. When well filled with the insects destroy by dipping in boiling water.

Molasses poisoned with Paris green or London purple will attract and kill flies and black ants.

These are but suggestions. They can be multiplied and improved upon. If insects are fought with persistent resolution, coupled with intelligence, they may be kept in check. The great trouble is, while one man fights his paltry foes his careless neighbor harbors and breeds them. This should be changed. What is needed is a grand co-operative alliance of the entire agricultural and horticultural interests of the State. An alliance that would declare ceaseless war upon the enemies of our crops, and protection to all agencies that assist in their destruction.

SCALE INSECTS.

Numerous inquiries have been received concerning scale insects which are found upon apple, maple, osage orange, and some other trees. The one infesting apple trees is commonly known as the Oyster Shell Bark Louse (*Metalapsis pomorum.*)

It is quite troublesome in some sections, especially where from cold winters or other causes the trees have become debilitated. Its presence is indicated by numerous grayish scales, about one-sixth of an inch in length, resembling an oyster shell in shape, distributed irregularly over the branches. Under these scales may be found a mass of eggs, which hatch about the first of June. The young insects, after crawling about a short time, attach themselves to the branch and become stationary. A scale soon forms over the insects. The female deposits her eggs, shrinking at the same time, becoming scarcely noticeable at the end of the process.

Another species (*Pulvinaria innumerabilis*) is found upon the soft maple and osage orange, and the same or a closely allied species infests the ash, elm, hickory, and basswood. These are much larger, being about one-fourth of an inch long, and often so numerous as to become very conspicuous.

REMEDIES.

A kerosene emulsion sprayed with considerable force is quite effective. Scrubbing the branches with a stiff brush or broom, dipped in the kerosene mixture, soft soap or lye, is effective where it can be accomplished, but is scarcely possible on small branches. In cities where sufficient force can be obtained, a strong stream of water from a hose, directed into the tree, is quite effective. It may not be possible by any artificial means to exterminate these insects, but they may be kept in check to a considerable extent. They often disappear quite suddenly, probably from the depradations of natural enemies.

By way of prevention it is well to examine young trees carefully before planting and remove all scales. This could also be done, in many cases, until the trees have attained considerable size.

THE FLEA BEETLE (*Haltica striolata*).

This enemy to young cabbage plants was successfully combatted the past season by means of water alone. Cabbage seed was sown where the bed could be reached with a hose. The plants were simply sprinkled several times daily from the time the seed germinated until they were transplanted. The beetle was by this means kept in check and the plants grew finely. This is a more effectual remedy than dusting the plants with ashes or lime, besides being much easier of application, where water is convenient, and having no tendency to check the growth of the plants.

INSECTS IDENTIFIED AND DESCRIBED.

The following is a partial list of the insects identified at the Station during the past year. In most cases, together with the name, a carefully prepared description of the species and the best known remedies, were given. The same species was often sent by persons residing in different parts of the State :

COMMON NAME.	SCIENTIFIC NAME.
Archippus Butterfly	*Danais Archippus*, Fabr.
The Oyster-shell Bark-louse	*Mytilaspis pomorum*, Bouchè.
The Tree Cricket, Snowy Tree Cricket	*Œcanthus niveus*, Harris.
Bark-louse	*Aspidiotus ancylus*, Putnam.
The Apple-tree Aphis	*Aphis mali*, Fabr.
The Grape Vine Bark-louse	*Pulvinaria innumerabilis*, Rath.
Indian Cetonia, Flower-beetle	*Cetonia Inda*, Harris.
The Two-spotted Tree-hopper	*Membracis binotata*.
The Chinch-bug	*Blissus leucopterus*, Say.
The Lance-rustic Moth	*Agrotis telifera*, Harris.
The Thistle Butterfly	*Cynthia Cardui*, Harris.
The Black Cantharis, Black Blister-beetle	*Cantharis atrata*, Harris.
The Joint-worm	*Issoma hordei*, Harris.
The American Bean-weevil	*Bruchus fabæ*, Riley.
The Cotton Boll-worm, Corn Worm	*Heliothis armigera*, Hubner.
The Squash-vine Borer	*Ægeria curcurbitæ*.

REPORT ON WEEDS.

The Station, in continuing its study of the weedy plants of the State, has during the past year, made the following points subjects of special consideration:

1. *Methods by which weeds are disseminated and propagated.*
2. *Habit of growth and duration of life.*
3. *The best methods of destruction.*

As was shown in the report of 1883, a very large proportion of our most troublesome weeds are importations; that is, they are not natives of this country, but have come, for the most part, from Europe. This leads us to consider the manner of the distribution of plants over the surface of the earth and to ask ourselves how these unwelcome intruders found their way to this country, and to our own State. The first thing that attracts attention is the wonderful fruitfulness of nature.

THE PROLIFICACY OF WEEDY PLANTS.

The whole economy of a plant, as far as its individual existence is concerned, is devoted to its reproduction. The quantity of seeds perfected by a single plant depends upon the circumstances or conditions by which it is surrounded. In order to obtain some idea of the number of seed produced by single plants growing in Central Ohio, and belonging to the class denominated "weeds," the following counts and estimates were made during the past season. Upon the rich bottom land of the Scioto Valley many of these plants grow with surprising luxuriance, and an average specimen found where conditions for growth are so favorable, probably attains a greater size than the maximum growth of the same species in other sections of the country. As this opportunity for growth is common over a large portion of the State of Ohio, the specimen plants used in determining the number of seeds fairly represents the prolificacy of that species for the State.

A careful count of the seeds in each of a large number of silicles of the *Capsella Bursa-pastoris* (Shepherd's Purse), showed a variation of from 18 to 34; the whole number counted averaging a little more than 25 each. Fifteen hundred silicles were found upon a medium sized plant, and taking 25 as the number of seeds in each silicle, we would find 37,500 seeds in a single plant.

A single plant of *Taraxacum Densleonis* (Dandelion), examined May 24, had 49 ripened heads. The seed, or rather the achenia, in each one of these heads were counted. The smallest number found was 206, the largest, 272; the average for the 49 heads being 247. Multiplying this by 49, gives 12,103 seeds from this one plant.

There are two seeds in each silicle of the *Lepidium Virginicum* (Wild Pepper Grass). On one plant, just an average sized specimen, 9,200 silicles were counted, making 18,400 seeds from a single plant.

July 10 the seeds on one plant of *Lithospermum arvense* (Corn Gromwell or Wheat Thief), were counted and found to be just a few short of 7,000.

August 5 the flower heads of ten plants of the species *Cirsium lanceolatum* (Common Thistle), were counted. The average for each plant was 203. The seeds, or achenes, of five heads were then counted. The largest number found in a single head was 335, the smallest, 287; the average for the five heads being 322. Multiplying 203 by 322 gives 65,366, as a fair estimate of the number of seeds produced by an average thistle, as it is found in Central Ohio.

August 28 the flower heads on two small plants of *Anthemis arvensis*, commonly known as Chamomile, were counted. One contained 100, the other, 163. The achenes in the heads of the former averaged 139, with a range from 121 to 168. The achenes in five heads of the latter averaged 110, with a range of 86 to 140. Thus, one plant contained 13,900 seeds, and the other 17,930.

An *Abutilon Avicennæ* known as the Butter Weed, Velvet Leaf, Indian Mallow, etc., contained 203 ripened seed pods. Ten of these, taken without selection, gave an average of 42.3—the extremes in the count being 36 and 45. The plant contained, therefore, 8,587 seeds.

A single average specimen of the diœcious plant, *Ambrosia artemisiæfolia*, (Rag Weed) was found, by actual count, to contain 4,366 seeds.

Two specimens, by no means large ones, of *Portolaca oleracea*, (Common Purslane), were examined during the month of August. One contained 2,660 pyxes, the other, 3,240. The seeds in ten pyxes of the former averaged 115, the range being from 46, the number found in the smallest pyxis on the plant, to 156, the largest number found. Multiplying the actual number of pyxes by 115, gives 305,900 seeds. Counting the seeds in 20 pyxes of the latter specimen gave an average per pyxis of 120, the variation in numbers ranging from 99 to 158. Multiplying 3,240, the actual number of seed capsules, by 120, the average number of seeds found in the 20 capsules counted, gives a product of 388,800, the total number of seeds in the plant.

Five plants of *Plantago major*, (Common Plantain), averaged 18 spikes of flowers each. The spikes averaged 370 capsules each; the capsules averaged 6½ seeds each, making 43,290 seeds per plant.

Ten heads of *Lappa major* (Burdock), picked without selection, contained 685 akenes, or seed. The heads on five ordinary sized plants were counted and they were found to average 556 each. Multiplying this by the average number of seeds found in each head, gives 38,086 seeds per plant.

These estimates show the enormous possibilities of increase of a single weed plant. It must be remembered however, that much of this seed has a low standard of vitality, and that many accidents may happen to prevent its development. Besides the immense number of weeds produced, we find many special provisions or agencies for their distribution.

PROVISIONS FOR THEIR DISPERSAL.

These may be divided into two classes, viz.: 1. *Those furnished by the plant itself.* 2. *Certain forces of nature or agencies outside of the plant.*

These two classes of means or provisions work together, the latter rendering the former operative. Belonging to the first class there are various structural modifications of fruit and seed. The forces which make up the second class are such as winds, streams, rivers, tides and ocean currents, and the agency of man and the lower animals.

There are many species of weeds which are provided with winged appendages to the fruit or seed which afford an efficient means for their dispersal. Thistles, dandelion and other weedy plants belonging to the natural order Compositæ are good illustrations.

These seeds are frequently wafted by the wind for miles in every direction from the parent plant.

Other seeds are provided with hooks or awns, which adhere to the clothing of men, the coats of animals, or the plumage of birds, and are thus being constantly distributed over vast areas. The burdock, cockle-bur, Spanish needles, hound's tongue, tick-seed, are among the illustrations that might be cited. In these and many other ways weeds spread themselves widely by means of self sown seeds.

They are not only blown about by the wind, and carried by birds and quadrupeds, but are also carried long distances by streams and rivers, lakes, seas and ocean currents.

THE AGENCY OF MAN IN THE DISTRIBUTION OF WEEDS.

Of the 182 weedy plants that are more or less troublesome in this State, 115 came from Europe. Man brought these, and has taken others in return. In this he has for the most part, been an unwilling agent. Weed seeds are transported in various ways. Packing material and products of various description often contain them.

When they have once gained a foot-hold in any country they are widely disseminated by railroads and other agencies of commerce. There are a few methods of distribution that deserve special mention. One is,

SOWING WEEDS WITH THE CROP.

This is a prolific source of many troublesome weeds. Too much care cannot be exercised in having seed free from weeds. Clean seed may cost slightly more at first, but it proves vastly cheaper in the end. By carelessness in the choice or preparation of seed, many farmers have brought upon themselves an almost never-ending source of annoyance and expense. The question may be asked, how can one always know pure from impure seed?

A careful examination will usually reveal any foreign admixtures. If any adulterations are found, and it is not known to a certainty that they are harmless, send a sample according to directions to the Station, where it will be examined, free of cost, and the percentage of impurities found, together with the name of each as far as possible, will be promptly reported.

With this privilege there is little excuse for sowing troublesome weed seeds; and any farmer who does not take the necessary precaution to see that his seed is free from foul weeds, may be justly denounced as an enemy to his class, and a foe to the well-being of society.

STABLE MANURE A SOURCE OF WEED DISSEMINATION.

Where stable manure is bought in towns or cities, and hauled directly to the field the land is often seeded with weeds. By thoroughly composting the manure, and not using it until a year after its manufacture, the evil may be averted in a great measure. Last year a piece of the Station's experiment grounds, which had received clean culture for several years, and appeared to be nearly free from weeds, was treated to a heavy dressing of fresh stable manure.

The weeds were very abundant on this piece, and twenty-six species were noted during the season. The weeds on adjoining land that received no manure were much less numerous, and less than half the number of species were found.

If weeds are not cut until they have matured their seed, it is better not to add them to the manure-heap or barn-yard. By so doing they will be likely to give trouble in the future. The best disposal of full grown weeds is to burn them, and carefully save and use the ashes.

THE MULTIPLICATION OF WEEDS BY DIVISION.

Such plants as the Canada thistle and couch or "quack" grass, though abundant in many parts of the State, are not often allowed to perfect their seeds upon cultivated grounds. Yet they rapidly increase by their creeping underground stems. Cultivation, which simply divides these underground parts, often seems to multiply rather than diminish these pests.

Where practicable such plants should be carefully rooted out and all parts carefully collected and burned.

HABIT OF GROWTH.

As we have already seen, this is a matter of great importance, inasmuch as the best method of treatment depends so largely upon it. As regards their manner of growth, weeds may be classified as follows:

1. *Upright Weeds.*—Those which grow straight from the ground. Usually fibrous rooted.
2. *Creeping Weeds.*—Those that send out runners above ground, which take root at different points.
3. *Running Weeds.*—Those which increase by spreading underground stems.
4. *Prostrate Weeds.*—Those which have weak stems, or trailing herbage, and cover a considerable space.
5. *Climbing Weeds.*—Those which cling to or twine around other plants.
6. *Tap-rooted Weeds.*—Those which form thick, fleshy roots, that grow straight downward.

Many weedy plants are of small size, with comparatively straight stems. Such weeds take up but little room individually, but are often very numerous, and may be very injurious to crops, especially during the early stages of growth. By a little neglect just at the critical time, root crops are frequently smothered and completely overpowered by weeds of this class. If the crop is not completely ruined, it often costs more than it is worth to remove these intruders. Taken in time these weeds may be readily killed. Neglect is fatal. The best time to destroy them is before they come up. In most cases this can be easily and cheaply accomplished by the use of the smoothing harrow or garden rake. Under no circumstances should weeds of this class be allowed to go to seed.

Perhaps the most troublesome plants of all, certainly the most difficult to eradicate, are those already alluded to, which belong to the class of "Running Weeds." In dealing with these we must look below the surface and if possible remove the underground stem. If this cannot be done, it is well to remember that the life and growth of plants is largely dependent upon the development of the leaf. If no leaf bearing stems are allowed to appear above ground the plant will ultimately perish.

The best way to master tap-rooted plants is to cut them off as far below the crown as possible. If cut off at the crown they will often send up a multitude of short stems and produce more seed than the original stem would have done.

DURATION OF GROWTH.

Like other plants, weeds may be divided into annuals, biennials, and perennials. The natural history of each species should be well known, for upon this is based many important remedial measures. As a rule, annual weeds are largely confined to cultivated areas. They should be closely watched, and never allowed to interfere with the growth of crops. By neglect we suffer the double injury of lessening the yield of the crop in which they appear, and providing a supply of seeds so that the pests will be continued, thus causing future trouble.

Biennial weeds, for the most part, produce no seed the first year, but seed is often produced quite early in the second season. On this account they should be destroyed during the first year of their existence. Most of the worst biennial weeds have fleshy or tap-roots. In exterminating these plants just as much of this root should be cut off as possible.

Perennial weeds are those the tops of which die down at the approach of cold weather, the roots remaining alive, and from them new shoots are sent up year after year. Many perennial weeds produce their flowers and seeds much earlier in the spring than annuals. On this account they should be most carefully watched. They are apt to be most troublesome in pastures and meadows, and are often very abundant along roadsides and fences. They should always be cut before they blossom, or at least before any seed is matured.

HINTS FOR THE DESTRUCTION OF WEEDS.

The complete extermination of weeds is no easy matter, yet within certain limits it is not only possible, but practicable. For nearly all cultivated grounds constant and continued clean culture is the best remedy. Clean culture has been practiced at the Station for the past three years, and grows easier each season. The best way to secure *clean culture* is to never allow weeds to breathe.

In pastures, meadows, and all uncultivated areas weeds should never be allowed to blossom.

Besides using every known precaution to prevent our land from becoming seeded, and adopting the methods already indicated for killing weeds, we should summon the law to our aid. Wise enactments, founded upon substantial information and judiciously framed, would, if enforced, aid us materially in our warfare against these intruders. Make it an offense punishable with fine and imprisonment for anyone to sell impure seed, or allow any weeds to go to seed on his property. This would tend to check at once the spread of weeds, and when people became better informed, and public sentiment thoroughly aroused, it would cease altogether.

A few weeks ago the Station sent out a circular asking for information concerning the following weeds:

1.	Ox-eye Daisy	*Chrysanthemum Leucanthemum.*
2.	Canada Thistle. Cursed Thistle	*Cirsium arvense.*
3.	Wheat Thief. Pigeon-weed. Corn Gromwell	*Lithospermum arvense.*
4.	Wild Carrot. Bird's-nest	*Daucus carota.*
5.	Toad-flax. Butter-and-eggs	*Linaria vulgaris.*
6.	Yarrow. Milfoil	*Achillea millefolium.*
7.	Evening Primrose. Yellow Primrose	*Œnothera biennis.*
8.	Yellow Daisy. Rough Rudbeckia	*Rudbeckia hirta.*
9.	Horse-nettle. Sand-brier	*Solanum Carolinense.*
10.	Bearded Plantain	*Plantago aristata.*
11.	Carpet-weed	*Mollugo verticellata.*
12.	Butter- or Pie-print. Velvet-leaf	*Abutilon Avicennæ.*

The circulars were sent to every county in the State, and were promptly answered. The following questions were asked concerning each of the above weeds:

1. Is it found in your county?
2. Is it troublesome?
3. Is it abundant?
4. Is it spreading?
5. When was it first observed?

A brief description and history of any other new weeds that might be known were also called for.

DESCRIPTIVE NOTES OF SOME OF THE NEWER AND LEAST KNOWN WEEDS OF THE STATE.

The following notes are compiled from the answers received from the circulars and from observations made by the Station:

OX-EYE DAISY—(*Chrysanthemum Leucanthemum*, L. or *Leucanthemun vulgare*, Lam.)

A perennial herb one to two feet high; often several stems from one root, erect or sub-decumbent, angular and striate, somewhat hairy, simple or slightly branched. Leaves one to two inches long, alternate, laciniately incised, upper stem-leaves oblong, sessile, slightly clasping, lower ones cuneate-spatulate, and the radical ones obovate-spatulate, petiolate. Heads many-flowered, one to one and a half inches broad; rays pure white, about equal in length to the breadth of the disk; disk-flowers yellow. Involucre broad, spreading; scales imbricate, margins russet-brown. Receptacle slightly convex, naked, dotted. Achenes (seeds) smooth, slightly ribbed, the ribs grayish, purple between. They are of such a size and weight as to be with difficulty cleaned from clover and the heavier grass seeds. Blooms in June, July and August, and the seeds begin to ripen the latter part of July. It is a native of Europe.

The Ox eye Daisy is found in all the eastern counties with the probable exceptions of Jefferson and Monroe counties on the river, and a section consisting of Stark, Tuscarawas, Southwestern Coshocton, Guernsey, Muskingum, Northern Perry and Licking counties.

In the northern part of the State there are portions of Ottawa, Seneca, and Crawford counties that are still free from it.

Jackson, Pike, Vinton, and portions of Meigs and Gallia counties constitute another section where there is none or but little of the Ox eye Daisy. In the western part of the State it is not so plentiful.

Mercer, Shelby and a part of Auglaize counties report none. Defiance, Henry, Hardin, Clarke, and a part of Logan are also free from it.

It is rapidly spreading over the farms of the State in all sections where it is found, excepting a part of the eastern border and a few of the interior counties. It has not yet become very abundant in the north-western, central and south-central parts of the State.

Except in a few places where it is not yet plentiful, it is universally regarded as a troublesome pest.

This weed has been sown throughout the State principally in grass and clover seed from the East. It also found its way into Kelly's Island, Erie county, in straw and packing for bottles; into Richland township, Holmes county and York township, Morgan county, as a garden flower. In Milton township, Mahoning county, and Barlow township, Washington county, it was sown as a forage plant for sheep.

The date of its introduction is very uncertain. It is supposed to have been first seen in this State about 1830 in Portage and Trumbull counties. About 1850 it was observed in the middle and western counties, and has since continued to spread rapidly over the State.

CANADA THISTLE, CURSED THISTLE (*Cirsium arvense*, Scop.)

A perennial; the rhizoma (underground stem) creeping horizontally six to eight or more inches beneath the surface of the ground, and giving off at intervals branches or stems that grow one and a half to three feet high, slender, smoothish, striate, branching towards the top; branches slender, somewhat woolly. Leaves four to ten inches long, slightly decurrent, waved-pinnatifid, sharp-spined, mostly smooth above, woolly or webby beneath. Flower-heads one-third to two-thirds inches in diameter, numerous; involucre nearly thornless; flowers rose-purple. Achenes (seed or fruit) oblong, provided with a copious pappus (plume). It blooms in July and begins to ripen its fruit in August. It is a native of Europe.

The Canada Thistle is quite generally distributed throughout the State. Of the eastern counties, Tuscarawas, Coshocton, Guernsey, Belmont and Washington are reported as being free from it. Richland and Pickaway in the center, and Auglaize, Mercer and Logan in the western part are reported as having none. Of the southern counties, Warren, Brown, Scioto, and Lawrence are still exempt, and probably several others, for some of the reports evidently referred to the Common Thistle. It is abundant in very few localities. In a part of those on the western broder it is making little progress. It is not regarded as a very troublesome weed in the central, western, and northwestern parts of the State.

It has been introduced into many parts of the State in grass and clover seed. The following counties are reported as having first received it in this way: Geauga, Licking, Mahoning and Summit. It was taken into Champaign, Geauga, and Greene in fruit tree packing; into Columbiana, Erie, and Greene with seed oats; into Hancock and Wyandot counties, by passing emigrants; into Holmes and Delaware by the railroads. It was found about the Indian villages at the time of the settlement of Henry, and is said to have been sown in Cuyahoga county, "out of spite."

PIGEON-WEED. WHEAT THIEF (*Lithospermum arvense*, L.)

An annual, growing 12 to 20 inches high, usually much branched, rough, hairy. Root reddish. Leaves alternate, 1 to 2½ inches long, entire, with only the center vein; lance-linear, upper ones pointed, lower obtuse, rough. Flowers small, white, solitary in the axils of the leaves and branches Achenes ovoid, pointed, rough, brown when mature; borne in fours, or fewer by abortion. Blooms from May until July and the fruit begins to ripen in June. While growing the plant is of a grayish or bluish green color; when dead and dry it is grayish brown, and quite rough and harsh. The seed is little larger than clover seed and very hard, giving the name to it of Stone-seed. It is also known as Gromwell and Red-root.

The Pigeon weed, although not reported in 1883 as occurring in the southern and eastern counties, is now quite generally distributed in Ohio. It is reported as not yet being found in the following counties along the eastern and southern borders, viz: Ashtabula, Portage, Mahoning, Tuscarawas, Belmont, Washington, Meigs, Gallia, Jackson, Lawrence and Brown. It is most abundant in the northern, central and south-western portions of the State, and is spreading most in the central, north-eastern and north western counties.

In most counties, or at least in all parts of the State, it is considered a pest. It is not regarded as very troublesome in a section in the middle of the State, consisting of Licking, Franklin, Fairfield, Madison and Pickaway counties; and in another, consisting of Williams, Defiance and Paulding counties. It has been disseminated most largely in Ohio, as in other places, in unclean grain and grass seed, and to some extent by birds.

WILD CARROT. BIRD'S-NEST (*Daucus carota*, L.)

Root spindle-shaped, yellowish; biennial. Plant grayish green, hairy, 2 to 4 feet high; stem slender, furrowed, branching. Leaves several times divided, the segments slender, pointed, ½ to 1 inch long. Flowers numerous, borne in umbels on long, slender, naked branches; white or cream colored—the central one often abortive and purple. Fruit oblong-oval, provided on the secondary ribs with prickles equal in length to the diameter of the fruit, somewhat barbed. In flower the umbel is nearly even across the top, but in fruit the outer umbelets curve inward, resembling a bird's nest. Blooms from July to September. Fruit ripens in September and October. Introduced from Europe. In Washington county the following observations were made for the Station by Messrs. J. F. Thompson and F. P. Deming. Twelve plants were examined, representing an average of a field of them. Average height of plants 3½ feet, ranging from 1½ to 5½ feet. Number of umbels per plant 9 to 52; average 27. Largest number of seeds on one plant 160,900; average 50,000.

The Wild Carrot is reported as not yet having found its way into Erie, Ashland, Richland, Licking, Henry, Hardin, Auglaize and Logan counties. It is not abundant in any very extended area in any part of the State, but is quite plentiful in portions of many of the counties. It is spreading with greater or less rapidity in nearly all sections in which it occurs—least in the southern and eastern counties. In some of the northern counties and a few of the middle and southern counties it is not looked upon as a very troublesome weed, but generally throughout the State it is regarded as a great pest. It has generally been spread over the State in unclean clover seed, some in grass seed and along the Ohio River counties by the overflows, leaving the seed upon the low land.

TOAD FLAX. BUTTER-AND-EGGS (*Linaria vulgaris*, Mill.)

A perennial herb, with a hard, creeping root, from which rise numerous branches, forming bunches or small patches. Stem 1 to 3 feet high, slender, smooth, very leafy, pale or bluish-green, occasionally branched near the top, and bearing several dense, spike-like racemes of flowers. Leaves smooth, pointed, 1 to 2 inches long, narrow. Flowers yellow, corolla bilabiate, personate, lower lips orange on the margin, spurred. Blooms from June to September, and seeds begin to ripen in August.

Toad flax is found in all parts of the State, and in most of the counties. It is not abundant in many places. It is, perhaps, more plentiful through the central part of the State than in other portions. It is spreading slowly in all sections, and is quite generally troublesome. It was introduced into nearly every part of the State as a garden flower.

YARROW. MILFOIL. (*Achillea millefolium*, L.)

A perennial herb 1 to 3 feet high, hairy, mostly simple, but branching at the top, forming flat-toped corymbs of dirty-white flowers. Leaves bright green, cut and divided into narrow, toothed segments, nearly sessile, 2 to 3 or more inches long—the radical ones often 6 to 10 inches long. Flowers numerous, small, in small heads arranged in corymbs, strong scented; ray florets white, roundish; disk florets whitish, sprinkled with resinous slots. The whole plant has a aromatic, bitter or pungent taste, and strong scent. Blooms from July to September. Fruit begins to mature in August. It is a native of Europe, where it has been regarded by some as of value in pastures.

Yarrow is universally distributed throughout the State, the only coun which it is reported as not found, being Lucas, Henry, Auglaize, Hard Preble. But it is not very plentiful in most of the counties. In the v part, Champaign is the only county reporting it as being abundant. the eastward it is more common, and in the eastern part of the Stat four counties—Lake, Trumbull, Stark and Tuscarawas—report it abundant. From these four counties reports show it is not spreading but all others of this part of the State report it spreading. Throu central portion of the State it is spreading but slowly, and little more in the western part.

The only counties in the western part of the State in which it is con troublesome are Hancock, Champaign, Greene and Brown. It is re troublesome in all the eastern counties except Trumbull, Stark and Tusca and in the middle counties it is reported troublesome wherever it is abu It has been spread almost entirely in grass seed.

EVENING PRIMROSE. YELLOW PRIMROSE (*Œnothera biennis*, L.)

A biennial, 2 to 6 feet high, rather stout, branching, hairy, green, som reddened on the south side. Leaves 2 to 6 inches long, rough, hairy, ovate- late, somewhat toothed, sessile. Flowers large, yellow, in a terminial, rathe spike, opening at night and withering the following day; 1 to 1½ inch broad inversely heart-shaped. Seed-pods obscurely four-sided, about 1 inch long, c ing numerous minute brown seeds. When mature the pods split at the top in valves, from which the seeds fall when shaken. Blooms from June to Sept and the seed ripens in August. It is a native of the United States, but beh Ohio like an introduced species.

The Evening Primrose is found in all but a very few counties. It i however, abundant except in Holmes, Mahoning, Summit, Ashland, rence, Ross, Champaign and Miami counties. It is spreading in counties in all parts of the State, but is not in many places regarded as noxious weed. The only counties in which it is reported as being t some are Holmes, Stark and Washington, in the eastern, Lorain. As Fairfield, Hocking, Meigs and Ross in the middle, and Paulding, Cham and Brown, in the western part of the State.

YELLOW DAISY. ROUGH RUDBECKIA (*Rudbeckia hirta*, L.)

A perennial herb, 1 to 3 feet high, rather stout, bristly-hairy, branching ne base. Leaves nearly entire, 2 to 3 inches in length, ovate-spatulate, three v the upper ones lanceolate, sessile. Branches leafless, or nearly so near the su each bearing a single large head of flowers, with 12 to 15 bright yellow rays sur ing the broadly conical disk of dark brown flowers and chaff. Blooms durin and August. It is a native of the western United States, and has been broug Ohio in clover and grass seed.

The Yellow Daisy is found in all parts of the State, but is not so generally present in the north western counties. It is not spreading much in the western and middle parts of the State, but is spreading in most of the eastern counties. It is regarded as a pernicious weed in all portions of the State, but not in every county. It has spread over the State in grass and clover seed not properly cleaned.

HORSE NETTLE. SAND-BRIER (*Solanum Carolinense*, L.)

A perennial herb, but firm and almost shrubby. Stem hollow, 1 to 2 feet high, branching, thickly armed with sharp, spreading, straw colored prickles. Leaves 4 to 6 inches long, one-half as wide, angular lobed, roughish, a few scattered spines along the midrib and larger veins on both sides. Petiole about one inch long. Flowers in racemes, near or opposite to the leaves, white or pale blue, nearly an inch across. Fruit a berry ½ to ⅓ inch in diameter, orange-yellow. Blooms in July and ripens its fruit in October. It is a native of the southern United States.

Horse Nettle. Many of the reports on this showed that some other plant was mistaken for this by the correspondent. It is becoming very plentiful in the southern part of the State, and in some places extremely pernicious. It was brought into Washington county by horses during the Rebellion; into Pike county by cattle from Kentucky; into Brown county by high water. It is most troublesome on sandy soils.

BEARDED PLANTAIN (*Plantago aristata*, Mx.)

An annual, with a short stem, about an inch high. Leaves linear, 4 to 8 inches long, ¼ inch wide, three veined, slightly woolly or naked, entire. Flower spikes 8 to 15 inches high, flowers larger than common plantain, arranged cylindrically at the summit, 2 to 6 inches along the stem, each accompanied by a bract, which is prolonged into a beard or awn ½ to 1 inch long. When young the spikes are very villous, and the leaves closely resemble Red-top grass leaves. The seeds are somewhat larger than those of common plantain, of a rich dark brown color, beautifully marked with white lines on the concave surface. Blooms in June and July. Seeds ripen in July and August. Native of Illinois and westward, from whence it was introduced into Ohio.

Bearded Plantain. Many of the reports intended for this weed were evidently made upon the common plantain (*P. major*). It was not found in this State until quite recently, but is now common in meadows in many places and is spreading rapidly with grass seed. It was with impure seed from the West that it first came into Ohio. As it is an annual it will not be apt to crowd out grasses in old and established meadows.

CARPET-WEED. INDIAN CHICKWEED (*Mollugo verticellata*, L.)

Annual, prostrate, stem slender, jointed, branching in all directions, forming roundish patches a foot or more in diameter. Leaves wedge shaped, in whorls at each joint of 5 or 6, of unequal size, but about 1 inch long. Flowers white, axilary, upon slender peduncles. Pods many-seeded. Seeds small. Blooms from J September; seed ripens from July till frost.

The Carpet-weed is a native of Ohio, and is pretty generally distribu is most plentiful on sandy soils. Many of the correspondents me other weeds, and a large number made no report upon this.

VELVET-LEAF. INDIAN-MALLOW. BUTTER-PRINT. PIE PRINT. INDIAN-E (*Abutilon Avicennæ*, Gærtn.)

Annual, 2 to 5 feet high, branched, the whole plant velvety-tomentous; the bark, hemp-like. Leaves 4 to 8 inches long, roundish, heart-shaped, toothed, very soft and velvety; leaf-stalk 3 to 5 inches long. Flowers yello inch across, solitary, on short peduncles in the axils of the leaves. Seed-p posed of 12 to 15 three-seeded, beaked carpels, arranged in a somewhat bell head. Blooms from July to September. Seed ripens from August till frost. of India.

Velvet-leaf is not reported generally in the north eastern and north-counties. It is abundant in almost all localities, but many counties h little of it. In the south eastern and north central portions of the appears to be least abundant. It is spreading most in the central and counties, and in these parts is quite a troublesome weed.

It was introduced into many of the counties as a garden flower, escaped from the gardens into cultivated fields, and in some places into m and pastures.

TABULATED STATEMENT.

A table was prepared, exhibiting all the answers to the questions in culars; but as it is so large, and the answers from some parts of the incomplete, it was thought best not to insert it. It will be kept, and a made to complete it for publication in a subsequent report.

LIST OF PLANTS IDENTIFIED AND DESCRIBED.

COMMON NAME.	SCIENTIFIC NAME.
Johnson Grass	*Sorghum halapense*, Pers.
Stipeled Sida	*Sida stipulata*, Cav.
Innocence	*Collinsia verna*, Nutt.
Periwinkle. Myrtle	*Vinca minor*, L.
Field Rush	*Luzula campestris*, D. C.
Long-leaved Stitchwort	*Stellaria longifolia*, Muhl.
Orchard Grass	*Dactylis glomerata*, L.
Field Sorrel	*Rumex acetosella*, L.
Bermuda Grass	*Cynodon Dactylon*, Pers.
Manna Grass	*Glyceria fluitans*, Brown.
Canary Grass	*Phalaris Canariensis*, L.
Blue Joint-grass	*Calamagrostis Canadensis*, Beauv.
Meadow Fescue Grass	*Festuca pratensis*, Huds.
Carolina Buckthorn	*Rhamnus Carolinensis*, Walt.
Rib-grass	*Plantago lanceolata*, L.
Yellow Hawkweed	*Hieracium aurantacium*.
Horse-Nettle	*Solanum Carolinense*, L.
Brunnicia	*Brunnicia cirrhosa*, Banks.
Running Buffalo Clover	*Trifolium stoloniferum*, Muhl.
Pennsylvania Blue-grass	*Poa compressa*, L.
Kentucky Blue-grass. June-grass	*Poa pratensis*, L.
Wild Carrot	*Daucus Carota*, L.
Canada Thistle	*Cirsium arvense*, Scop.
American Germander	*Teucrium Canadense*, L.
Golden-rod	*Solidago altissima*, L.
Rigid Sunflower	*Helianthus rigidus*, Raf.
Blue Vervain	*Verbena hastata*, L.
Wolf-berry	*Symphoricarpus occidentalis*, R. Br.
Many-flowered Aster	*Aster multiflorus*, L.
Smooth Aster	*Aster simplex*, Willd.
Wild Mint	*Mentha Canadensis*, L.
Diodia	*Diodia teres*.
Elephant's Foot	*Elephantopus Carolinensis*, Willd.
Bastard Pennyroyal	*Trichostemma dichotomum*, L.
Golden Aster	*Chrysopsis villosa*, Nutt.
Psoralea	*Psoralea argophylla*, Pursh.
Closed Gentian	*Gentiana Andrewsii*, Griseb.
Wild Bergamont	*Monarda fistulosa*, L.
Northern Wormwood	*Artemisia frigida*, Willd.
Rattlesnake-root	*Nabalus racemosus*, Hook.
Blue Aster	*Aster lævis* var. *Cyaneus*, Wood.
Blue Salvia	*Salvia azurea*, Lam.
Giant Hysop	*Lophanthus scrophulariæ*, Benth.

COMMON NAME.	SCIENTIFIC NAME.
Canada Hawkweed	*Hieracium Canadense.*
Tall Wild-lettuce	*Nabalus altissimus* var. *ovatus*, Wood.
Common Golden-rod	*Solidago Canadensis*, L.
Bishop's Cap. Mitre-wort	*Mitella diphylla*, L.
Beech Fern	*Phegopteris polypodioides*, Fee.
Spleenwort	*Asplenium Felix-fœmina*, Bernh.
Robin's Plantain	*Erigeron bellidifolium*, Muhl.
Spring Cress	*Cardamine rhomboidea* var. *purpurea*, Torr.
Archangelica	*Archangelica hirsuta*, Torr. and Gray.
Common Meadow-Sweet	*Spiræa salicifolia*, L.
Bottle-brush Grass	*Gymnostichum Hystrix*, Schreb.
Golden-rod	*Solidago arguta*, Ait.
Common Balm	*Melissa officinalis*, L.
Bird's-nest Fungus	*Crucibulum vulgare.*
Marsh Fleabane	*Pluchea fœtidus*, D. C.
Blue Curls	*Trichostemma lanceolatum*, Benth.
Hyptis	*Hyptis Emorgi*, Torr.
Marsh Flea-bane	*Pluchea borealis*, Gray.
Garden Orache	*Atriplex hortensis.*
Missouri Currant	*Ribes aureum*, Ph.
Meadow Fescue Grass	*Festuca elatior* var. *pratensis*, Gray.
Whitlow grass	*Draba cuneifolia*, Nutt.

The above named plants were received from nearly all parts of the United States and from Canada. With the names, descriptions were also given in most instances. Inquiries were largely concerning honey-producing plants. The value of others for hay, forage and other purposes, whether they would be likely to prove troublesome weeds, and similar topics were subjects of inquiry.

The many questions regarding the specimens were answered as far as possible. Of several of the species, two or more specimens were received from different localities.

REPORT ON GRASSES.

In point of economic value there is no family of plants that can for a moment compare with the *grasses*. Its members constitute the basis of all agricultural wealth.

This being the case, every farmer should be thoroughly acquainted with the structural characteristics, habits of growth and properties of the valuable species belonging to this important family.

Agricultural grasses may be classified as follows:

I. *Cereal grasses*, such as wheat, corn, oats, barley, rye, and rice.

II. *Pasture, meadow and lawn grasses*, such as June grass, red-top, timothy, orchard grass, rye grass, oat grass, sweet-scented vernal grass, etc.

III. *Cane grasses*, sorghum, broom-corn, sugar cane, etc.

IV. *Weedy grasses*, couch or quack grass, chess, summer grass, wild rye, pigeon grass, etc.

V. *Ornamental grasses*, such as pampas grass, variegated maize, feather grass, etc.

In ordinary language the word grass is applied to the second division alone, but the other divisions are members of the same family, and have the same general characteristics. Clover, alfalfa and the like, are not members of the grass family and should never be classed with them.

There are only two orders or families of plants which can be mistaken for grasses. These are the *sedges* and *rushes*. True grasses can always be distinguished by the following characters: Every plant that has them is a grass, and no plants except true grasses possess them.

CHARACTERISTICS OF GRASSES.

1. *A hollow or pithy stem, which is circular and usually unbranched.*
2. *The stem is separated into sections or joints by horizontal partitions called nodes.*
3. *The leaves are linear, alternate and two-ranked.*
4. *The sheath of the leaf surrounds the stem from the node to the blade.*

Usually the sheath of the grass is split its entire length on one side. Whether split or not it can be readily removed from the stem without tearing it.

Every plant that has the above characters belongs to the grass fami following points will enable anyone to distinguish grasses from sedge

GRASSES.	SEDGES.
Hollow, round stem.	*Solid, triangular stem.*
Split sheath, easily removed.	*Sheath entire, not easily rem*
Leaves two-ranked.	*Leaves three-ranked.*

There are in the State of Ohio 140 species of *sedges*—all of which a cally worthless.

There are 125 species of *grasses*, nearly all of which possess some va be able to distinguish the members of one family from another is th matter of considerable importance.

During the past two years the Station has tested, in a small way, over dred varieties of pasture, meadow and lawn grasses. Many of these been grown on sufficiently large areas to admit of accurate judgment co their value. The following condensed notes embody about all the obs concerning the different varieties in our possession that are of gener utility:

TIMOTHY. HERDSGRASS. CATSTAIL (*Phleum pratense*).

This is probably the best known of all our cultivated grasses. It is nearly all meadows and pastures, and is very highly esteemed especi hay crop. It is more largely cultivated for this purpose in the State than any other single species.

Timothy was undoubtedly introduced originally from Europe, and extensively cultivated by Mr. Timothy Harrison, of Pennsylvania, w duced it into England. The value of timothy has been overrated, a farmers have became better acquainted with other species it will not b erally cultivated. One reason why timothy is such a favorite is that abundantly, and the seed separates readily from the chaff or glumes round it. On this account its purity and quality can be easily det Another reason is that it makes fairly good hay if not cut until someti blossoming. Cutting should not be delayed too long, however, as t of the crop is very much lessened thereby. The best time for ha timothy is when about half the blossoms have turned brown, the uppe of the spike still remaining purple.

The most serious objections to timothy are that it is of little value fo ing after mowing, and that it is liable to be injured by the close fe horses or sheep. Another objection sometime urged is that timothy the soil.

This is true, but it must be rembered that nearly all crops exhaust th proportion to their value. A crop that does not draw upon the store food in the soil is not worth harvesting. In our experiment, timothy appears to be best adapted to moist, loamy ground. It does not do so well upon either dry sandy or gravelly soils or hard, compact clays. The plots at the Station grounds on peaty or loamy soils have done well. For the past three years these plots have been in full bloom about July 1st; ready to cut one week later. Ripe July 20th, with an abundance of seed. Height, 3½ feet; weight of seed per measured bushel, 45 pounds.

RED-TOP (*Agrostis vulgaris*).

Next to timothy the Red top is one of our best known cultivated grasses. It is a perennial native species, and is cultivated in Europe under the common name of "bent grass." It appears to prefer rather moist soils, and thrives better than most cultivated species on cold, undrained upland. It yields a large quantity of hay, rather light in proportion to bulk, but very palatable and readily eaten.

Our plots were in full bloom June 27. Ripe July 21. Height, 30 inches; weight of seed per measured bushel, 22½ pounds.

Agrostis canina (Brown Bent Grass) and *Agostis stolonifera* (Fioun Grass) are closely allied species. They are introduced grasses, and are of comparatively little agricultural value on well drained land. The latter species does well in swampy,.boggy places, growing in dense tufts and spreading rapidly by its long, creeping stems. At the Station it grew in scattered bunches and reached a height of twelve inches.

JUNE GRASS, OR KENTUCKY BLUE GRASS. (*Poa pratensis.*)

This species is too well known to require any extended description. It is found native in all our Northern States, and thrives best upon limestone soils. It reaches its greatest perfection in what is know as the "Blue Grass Region," of Kentucky. It varies much according to the soil and climate. In Ohio it is regarded with much more favor in the Southern part of the State than it is in the Northern. The farmers of Kentucky regard it as the most valuable of all grasses for hay and pasturage. It is one of the most widely diffused species in the world, and is found in greater or less abundance in all the best meadows and pastures of Europe, as well as America.

Its chief value is for permanent pastures and lawns. Unless in highly favored sections its growth is rather too short to make a valuable hay crop. Here on the experiment grounds it is one of the hardiest grasses that we have tested. No amount of cold or exposure seems to injure it. Last year it was in full bloom June 1, and the seeds were fully ripe two weeks later. Height, 10 to 12 inches; weight of seed per measured bushel, 14 pounds.

ROUGH STALKED MEADOW GRASS. (*Poa trivialis*).

This, like its first cousin, June Grass, is a valuable grass in agriculture. It should never be sown alone, but mixed with other species. It delights in rich, moist soil, where it attains good size and yields an immense product.

It is more valuable for hay than the preceding, and less valuable for pasturage. Like timothy, it may be cut some time after blossoming and still retain its nutritive qualities. It is readily distinguished from June grass by its fibrous roots and rough sheaths. This latter character gives it the name of "rough stalked meadow grass." This grass was not in full head until June 20; blossomed about July 1, and was ripe about three weeks later. Height, 30 inches; weight of seed per measured bushel, 15 pounds.

FOWL MEADOW GRASS OR FALSE REDTOP. (*Poa serotina.*)

This has not given very satisfactory results. It grows quite tall and thick, but seems to be quite seriously affected by the drought. It is probably best adapted to moist situations. In time of blossoming and maturity it appears to agree with the rough stalked meadow. It bears a large quantity of seed.

WOOD'S MEADOW GRASS. (*Poa nemoralis.*)

Resembles fowl meadow grass, but is somewhat earlier. Did poorly last year. In head June 2; ripe June 20; twenty inches tall; weight of seed per measured bushel, fifteen and a half pounds.

At least half a dozen other species or vari ies of Poa were tested, but none of them appeared to possess any special value.

ORCHARD GRASS OR COCK'S FOOT. (*Dactylis glomerata.*)

This certainly stands near the head of the list of valuable forage grasses. It is rapidly coming into favor, and is now quite widely disseminated throughout the State. It is found not only in pastures and meadows, but is admirably adapted to partially shaded locations, such as orchards and along roadsides.

This grass is indigenous to every country of Europe, and is found in Asia, Africa and America. In the United States it was cultivated in Virginia in 1750, and was soon thereafter introduced into England. It is quite aggressive and spreads rapidly, but is very sensative to good or bad treatment. It is specially adapted to strong, rich lands. It affords pasturage early in spring, and yields a great amount of aftermath. It often looks coarse, but in reality is tender, palatable and nutritious. The habit of growing in tufts or bunches may be overcome by sowing the seed more thickly, and by the use of the harrow in early spring. Some farmers sow it with clover, and like it better than timothy for this purpose. There are few who have given this grass a fair, impartial trial that are not well pleased with it. It should be cut for hay when in blossom, or very soon after. Ripe orchard grass makes very poor

poor hay. In our trial plots the orchard grass has not winter-killed, and has invariably yielded a larger amount of early foliage than any other variety. It begins to head about the middle of May, and is in full bloom the second week in June. Height, forty inches; weight of seed, varies from twelve to fourteen pounds per bushel.

MEADOW FESCUE. (*Festuca pratensis.*)

This is a highly esteemed forage grass, equally good for permanent pastures or meadows. It appears to be especially adapted to heavy loams and clayey soils. It flourished remarkably well during the excessive drouth of last season. It roots deeply and is probably well suited for dry climates. Reports of successful growth in the South have from time to time reached the Station. It is undoubtedly a promising variety for that section, and appears to do well in Kansas and Nebraska. It is known by the name of Randall grass in Virginia. It has considerable tendency to grow in tufts or bunches, although this habit is less marked than it is in the tall fescue (*Festuca elatior*). Last year it began to head June 1 and was ripe about two weeks later. Height, 24 to 28 inches. Weight of seed, 14 pounds per bushel.

TALL FESCUE GRASS. (*Festuca elatior.*)

This, like the preceding species, is cultivated quite generally throughout Europe. It bears a close resemblance to the meadow fescue, but grows somewhat taller and has firmer, broader and longer leaves. It heads, blooms and ripens the same time as the meadow fescue. Our experiment plot averaged 30 inches in height.

In addition to the above we have trial plots of the following Fescues: *Festuca dumetorum*, *Festuca duriusculz*, *Festuca peterophylla*, *Festuca ovina*, *Festuca rubra*, *Festuca sylvatica*, *Festuca tenuifolia*. The merits of these will be reported as soon as they have been fairly tested.

PERENNIAL RYE GRASS. (*Lolium perenne.*)

This is a tender, nutritious grass, starting early in spring and growing all summer. In Great Britain it is the commonest and most useful species of grass grown and is largely sown in connection with clover. The seeds of this grass are large, possess great vitality and make strong, vigorous plants soon after sowing. The leaves are flat, long and glossy. In England, where it is especially valued, great care is taken in the selection of seed, and there is a tendency to form numerous varieties. Some of these have been introduced into this country. That known as Pacey's rye grass has been tested in several places. It seems to grow more thriftily, but is less hardy—more liable to winter-kill—than the ordinary form. All of the varieties were greatly injured last winter.

THE ITALIAN RYE GRASS. (*Lolium Italicum.*)

Although given a specific name, is probably nothing more than a well marked variety. It is quite tender, and in this State must be treated as an annual. It is also ill adapted to dry weather. Would probably succeed best where irrigation could be practiced. The rye grasses blossom here before the middle of June and the seeds are ripe about two weeks later. Height averages from 24 to 30 inches. Weight of seed 20 pounds per bushel.

MEADOW OAT GRASS. (*Avena pratensis.*)

A native of Great Britain but now grown to a considerable extent in this country. A perennial grass, growing about three feet high, with broad, flat leaves. It starts early in the spring, is vigorous, hardy, and stands up well. Wherever it has had a fair trial it has given good satisfaction. It is sometimes called "evergreen" grass. It is very palatable, but we are unable to speak of its nutritive qualities. It does not seed readily, many of the flowers being sterile.

TALL OAT GRASS. (*Avena elatior.*)

Has made an excellent growth at the Station for the past two years. It blossomed in early June and was ripe by the middle of the month. Height 40 inches.

We are testing several other species of oat grass, of which reports will be given later.

THE MEADOW FOXTAIL. (*Alopecurus pratensis.*)

This is an early blooming species of grass, not very common in Ohio. It is the first to start in spring and the first to mature its seed. It is better adapted for pastures than for meadows. It is greatly relished by stock, quickly renews its leaves after being grazed off, and possesses great permanence. It does not endure drouth as well as some other species, but is particularly well adapted for moist situations or irrigated meadows. Last season this grass was in head by the last of April and in full bloom May 15. Ripe June 1. Height 20 inches. The seeds are extremely light, averaging about five pounds per bushel. The difficulty of procuring good seed appears to stand in the way of its general introduction.

THE SWEET SCENTED VERNAL GRASS. (*Anthoxanthum odoratum.*)

This is also an early species, and as its name suggests, is an agreeably scented grass. It does not yield a very large product, but its peculiarly sweet odor when wilted gives it considerable importance. The odor is due to benzoic acid, the same as is found in the Tonka bean and sweet clover. It thrives best in a rich soil, and in cool weather. With us it does not appear to be a very aggressive species, and has little value except as a flavoring. It should form a small part of mixtures for the lawn. The seed weighs about six pounds per bushel.

The above list includes all the varieties that have been tested long enough to warrant a report, or appear to possess any special agricultural value.

It is the purpose of the Station to extend its experiments and tests with grasses just as fast and far as the means at its command will permit.

GRASSES FOR A LAWN.

Nothing adds more to the attractiveness of a home than a fine, well kept lawn, and the importance of "grasses" as agents of decoration and ornament can hardly be overrated.

Grass in the shape of a well kept lawn is one of the simplest and yet the loveliest element in every landscape scene.

The essential requisites for a perfect lawn may be divided into the four following heads:

1. *A deep, rich soil with a carefully prepared seed-bed.*
2. *A proper selection of grasses.*
3. *Thorough mulching of the ground after seeding.*
4. *Frequent watering and mowing; weeding when necessary.*

Good lawns are often spoiled by making unnecessary walks and drives, and by excessive planting of trees and shrubs. Grass will not grow thriftily in dense shade, and no lawn can look well cut up by numerous walks and drives.

Good lawn grasses must answer the following requirements:

1. *They should combine the finest possible leaf growth with a capability of renewal under constant cutting.*
2. *They should possess the power of intimate weaving one with the other so as to form a stiff sod.*
3. *The different varieties should grow with equal rapidity so as to preserve the same height.*
4. *They should occupy the ground so completely as to exclude all other plants.*

The seeding of a lawn should be done in early spring, the ground having been thoroughly prepared the previous autumn. After sowing the seed cover the surface an inch deep with fine stable manure. This is needed as shade and mulch.

If the work is well done, the lawn will look well by the last of June, and require cutting by that time. Some weeds will naturally appear. The annuals being frequently cut off cannot seed and will soon be killed. Perennials, like dock and plantain, should be removed by hand.

After experimenting with various mixtures of seed, we have found the following to give the most satisfactory results:

I. MIXTURE FOR FINE LAWNS FREQENTLY MOWN.

June grass or Kentucky blue grass (*Poa pratensis*)	10	pounds.
Red-top (*Agrostis vulgaris*)	10	"
Perennial Rye grass (*Lolium perenne*)	10	"
Rough meadow grass (*Poa trivialis*)	5	"
Timothy (*Phleum pratense*)	5	"
Sweet vernal grass (*Anthoxanthum odoratum*)	5	"
White clover (*Trifolium repens*)	5	"

The above mixture will be sufficient to seed an acre. If less ground is to be sown, use the seed in proportion.

It is frequently desirable to keep larger areas of land in the immediate vicinity of the house in the form of *lawn meadows*. Such grounds may be kept in fine order by mowing them several times during the season, and still yield good crops of hay. The following mixture of seed will prove satisfactory for such places:

II. MIXTURE FOR PERMANENT LAWN MEADOW.

June grass or Kentucky blue grass (*Poa pratensis*)	10	pounds.
Red-top (*Agrostis vulgaris*)	10	"
Timothy (*Phleum pratense*)	5	"
Perennial rye grass (*Lolium perenne*)	5	"
Rough meadow grass (*Poa trivialis*)	5	"
Red clover (*Trifolium pratense*)	5	"

REPORT ON FOREST TREE CULTURE.

A recent report of the forest condition of Ohio, made by the Department of Agriculture at Washington, through its division of Forestry, presents some important, not to say startling, facts, concerning the rapid consumption of the timber of our State. According to this report, in the year 1853 a little more than 55 per cent. of the total area of the State was covered with forests. In 1870 this percentage was reduced to 38, and in 1881 it was found that only 20 per cent. of the total area of the State was devoted to the growth of timber. While the rate of decrease in the different counties has been quite variable, there is not a single county in the State that does not show a diminution of 5 per cent. during the years between 1870 and 1881. The average decrease for the whole State during this period is about 18 per cent.

Farmers of Ohio, are you not making a sad, a fatal miscalculation in thus cutting off your woodland? You calculate that the additional grass and grain you will be able to grow in its stead will more than pay for the coal you need for fuel, and the lumber and timber that may be required. This is a grevious mistake; a mistake if even the lack of timber alone is considered; a still greater mistake when we recognize how much the soil will lose of its too often scant supyly of summer moisture, how springs regarded as never failing become dry, and brooks and streams cease to flow at one period and cannot be kept within bounds at another; how the harsh, pitiless winds of winter sweep with intesified force, or cyclones in summer prove destructive to life and property.

It is an entirely safe proposition to assert that a large majority of the farms of Ohio, now destitute of woodland, would yield a greater average product if from one-fifth to one-fourth of the most exposed, and least valuable portions for cultivated crops, were thickly covered with forest trees.

Among the many priceless inheritances which we as citizens of Ohio enjoy, perhaps there is none to be compared with our rich and fruitful climate. Judged by the variety and excellence of our vegetable products, we have one of the best climates in the world. Just consider what a variety of excellent fruits, grains, grasses, garden vegetables, forest trees, etc., we grow right here in our State. If called upon to name a single feature of our economic condition that most favorably distinguishes Ohio from most of the other Stat from all other countries, we would at once point to the great varie excellence of our farm and garden products. There is scarcely a far large or small, in the great commonwealth of Ohio, where good crops of corn, oats, barley, rye—all the valuable grains—cannot be successfully The same is true with regard to our grasses, fruits, and garden vegetabl

This is not true of any other country. In Europe Indian corn thri indifferently, and in many places will scarcely grow at all. In man parts of the world the varieties of grain or vegetables, that can be rais any degree of success, is limited. Here we can produce an almost ending variety. Besides the grain, fruit, and vegetables, consider the ous varieties of valuable grasses and equally numerous and valuable v of forest trees.

We have one hundred and twenty-five different species of grasses State, and there is no country in the wide world that possesses so varieties of valuable forest trees, and no State where they will grov readily, more thriftily, and more surely.

Truly we have a rich inheritance in our climate. Are we guardi zealously as we should? No! We are squandering it by the reckless c tion of our timber. Springs and wells are failing, our streams are less r floods and drouths are more common, and come with greater severity are more destructive, and our climate is less genial than it was.

To say nothing about the effect upon our climate, the wanton waste timber, without any effort to make good the loss, will oblige those wh after us to pay many times the cost at which we might and should hav up the supply.

Trees may be cultivated for three distinct and special purposes, viz: *timber.* 2. *For shelter and protection.* 3. *For orniamental purposes or ment.* For whichever of these purposes trees are planted the effect up climate cannot but be beneficial. In answer to the question, Where to the Station would say that all ravines and steep hillsides, all rough, broken land, every acre that is not under cultivation, or is cultivated a should be devoted to our most valuable varieties of timber trees.

Protecting belts of trees are needed wherever buildings, orchards, g etc., are exposed to cold, sweeping winds. The banks of streams, open ponds, etc., may often be so planted with trees that they will be protect abrasion by floods and rapid currents. Hillsides may be protecte washing in the same way. For the purpose of adornment our publi should be belted with well selected varieties of trees, and school yards parks, fair grounds, etc., should be judiciously ornamented. There is s a farm in the whole State in which some forest trees might not be plant immediate advantage and profit. Much good might be done in the way of beginning now to preserve and improve our existing woodland.

Farmers usually display judgment and care in selecting good varieties of grain, fruit and vegetables for their cultivated fields, orchards and gardens. They can't afford to grow the poorer sorts, and it would be foolish to attempt it. Yet there are many who are still making the costly mistake of preserving indifferent or nearly valueless varieties of timber where the best and most valued would grow just as surely and as rapidly.

Nothing can be more wasteful than to allow black oak, sycamore, soft maple, alder, etc., to cumber the ground where white oak, walnut, hickory, locust, hard maple, etc., can be grown with equal care and luxuriance. Hence, the first step in the improvement of our present woodland should be to remove all worthless varieties and to encourage the valuable sorts to take their place. In order to keep up a constant succession of young trees of the best varieties it is necessary—

1. *To allow no stock to run in wood lots for purpose of forage.*
2. *To carefully guard against fire.*
3. *To plant seeds in vacant places of such varieties as are most desirable.*
4. *To keep down the shoots of all inferior varieties.*
5. *To trim up the valuable sorts so they may grow tall, forming trunk rather than branches.*

Among other things that would encourage the preservation and improvement of our woodland, the Station has recommended the following:

1. The exemption from taxation of a certain percentage of woodland on each farm.
2. The appointment of a State Commission of Forestry to co-operate with and supplement the work of the Division of Forestry in the National Department of Agriculture.
3. The teaching of Practical Forestry in the Agricultural Department of the State University.
4. The establishment of a State Arboretum where every species and variety of our forest trees could be seen growing and its merits thoroughly tested.

ARBORITUM AND FORESTRY PLANTATION.

The Ohio State University has made a small beginning in the way of establishing an Arboritum. It has also a small plantation of yellow locust and catalpa, now seven years old.

These trees are planted in rows four feet apart, and about two feet apart in the row. They are on river-bottom land, were cultivated for the first two seasons, after which they were left to themselves.

The locusts have made much the better growth.

These now average twenty-five feet in height, and have a diameter of —— inches.

The catalpas are only two thirds as high, and are much branched. For timber their growth has been very unsatisfactory. This is owing, in part at least, to allowing the trees so much space, and to neglect in trimming.

These trees have passed through two severe winters, the temperature ranging as low as 32 degrees below zero. They have been killed back more or less, but not seriously injured. So far, the locust is entirely free from the borer, and if the immunity continues, is probably one of our most valuable timber trees.

As a rule in establishing a forest plantation, it is better to grow several varieties together. Then if some insect enemy of other trouble should destroy one of them the residue may remain uninjured and thrifty. If all do well, these varieties that promise to be of the greatest value can be retained.

Another point to be born in mind is this, that in sowing seed, or planting young trees for timber, there is little danger of using too much seed or overcrowding your trees. *To plant thickly is the great secret of success.*

BEST VARIETIES.

During the past two years, the following varieties have made the most satisfactory growth, and may be regarded as the most promising:

1.	Yellow or Black Locust	*Robinia pseudacacia.*
2.	White Ash	*Fraxinus Americana.*
3.	Black Walnut	*Juglans nigra.*
4.	Black Cherry	*Prunus serotina.*
5.	Catalpa	*Catalpa speciosa.*
6.	European Larch	*Larix Europea.*
7.	Chestnut	*Castenea vesca.*
8.	Hard Maple	*Acer sacharinum.*
9.	White Oak	*Quercus alba.*
10.	Hickory	*Carya tomentosa.*

The best evergreens for "protecting" belts are Austrian Pine (*Pinus Austriaca*) and Norway Spruce (*Abies excelsa*).

HINTS FOR TRANSPLANTING SEEDLING TREES.

As a rule this operation should be performed after the first season's growth. In some cases if the season has been unfavorable, the variety a slow growing sort, and the seedlings are not crowded, it would be better to leave them in the seed-bed another year.

Trees may be transplanted in the fall or spring. This is a point that must be determined by the exercise of judgment. In forestry, as well as elsewhere, you should absolutely trust nothing but your own senses. Trees may be taken up in the fall, and prepared for planting in spring. This consists in cutting of from one-half to two-thirds of the tap-root, shortening in or removing side branches, and "heeling in." The top should rarely be cut back when growing trees for timber.

Plant thickly in rows, with full purpose to cultivate; thin and prune as circumstances may dictate.

Never plant a tree that has any dead or diseased roots.

Never plant seedlings any deeper than they were in the seed-bed.

REPORT OF THE BOTANIST.

SEED TESTS—WHEAT.

VARIETIES.

The testing of seeds, as to their vitality, has been continued since th cation of the report of 1883.

Wheat was tested about the time of the fall seeding. The reason for at this time was, that the wheat might be thoroughly dried, and as possible in the same condition as that sowed in the field. Two hundr twenty-two tests were made of wheat, embracing a hundred and thirty va all but eleven of which (tests 1412 and 1423 inclusive) were grown at tion. As the condition under which the eleven varieties above me were grown and harvestsd are not known, the results of their tests included in the following calculations. All the other varieties were harvested, and selected under like conditions, except where noted effect.

In Table I are given the details of the test of most of the varieties. T quality of the wheat harvested in 1884 was superior is shown by the which may be briefly stated in the following—

SUMMARY TO TABLE I. (Tests 1258 to 1357.)

	Minimum.	Maximum.	M
Time till first seed germinated......................	15 hours.	25 hours.	17.6
Time till half germinated.........................	18 hours.	95 hours.	26.8
Time till last germinated...........................	1 day.	9 days.	4.6
Total number of seeds germinated................	80 per cent.	100 per ct.	97.3

Number of tests in which all germinated.............................. 42 per c
Number of tests in which less than 90 per cent. germinated...... 7 “

Table I is sufficiently plain to be understood with little explanation. first column, after the name of the variety, is given the number of hou the time the seeds were put into the tester until the first one had germ *i. e.*, the radicle had protruded through the seed coat. In the next co given the number of hours from the time the test was begun until half the sprouted seed had germinated. The third refers to the sprouted seeds only, not to the whole number used in the test. The next column gives the time, in days, until the last seed sprouted. The last column gives the total per cent. of seeds that sprouted during the period of the test.

The soil in which the wheat was germinated was kept at a temperature of 80° to 85°, Fahrenheit's scale.

SEED TESTS—TABLE I.—VARIETIES OF WHEAT.

Test number.	Variety.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.
1258	Alabama	18	41	9	96
1259	American	17	22	4	80
1260	Andrew's No. 4	21	40	7	100
1261	Armstrong	17	22	5	98
1262	Arnold's Hybrid	17	41	9	93
1263	Bennett	17	20	4	100
1264	Big Frame	19	....	9	92
1265	Big May	18	36	4	100
1266	Blue Stem	16	20	1	97
1267	Boyer	17	22	4	100
1268	Brady Lake	18	26	4	98
1269	Buckeye	17	26	4	100
1270	California Blue Stem	18	35	5	100
1271	Canada Club	17	24	3	95
1272	Canadian Express	17	22	6	100
1273	Champion Amber	18	28	4	98
1274	Cherry White	18	24	3	100
1275	Cornell, No. 1	17	23	3	91
1276	" No. 3	17	....	5	97
1277	" No. 4	18	25	3	100
1278	Dallas	....	24	7	98
1279	Datt Red	19	....	7	100
1280	Deihl	17	22	5	100
1281	Deihl X Mediterranean	17	68	9	89
1282	Democrat	16	21	2	97
1283	Early May	19	26	5	99
1284	Egyptian	17	18	2	100
1285	Emporium	17	24	3	99
1286	Emporium Scott	17	24	3	100
1287	Fenton	17	24	4	98
1288	Fultz	18	24	6	96
1289	German Amber	18	25	4	99
1290	Golden Prolific	17	24	4	93
1291	Golden Straw	17	24	6	96
1292	Gold Medal	17	....	3	100
1293	Heckman	17	....	6	100
1294	Heighes Prolific	17	....	5	100
1295	Hungarian White Chaff	19	49	8	97
1296	Kentucky White	17	40	8	99

TABLE I.—Continued.

Test number.	Variety.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.
1297	Landreth	16	19	2
1298	McGhee's Red	18	50	8
1299	" White	17	40	7
1300	McPherson	16	20	3
1301	Mammoth Red	16	22	2
1302	Mediterranean	16	21	4
1303	Michigan Amber	18	21	5
1304	" Bronze	18	23	6
1305	Mich Wick	15	21	2
1306	Nigger	17	21	2
1307	Ostery	18	51	9
1308	Palestine	17	23	8
1309	Pool	17	23	5
1310	Porter	19	95	9
1311	Powers	16	20	2
1312	Red Amber	17	48	8
1313	Red Fultz	17	19	2
1314	Red May	17	....	9
1315	Red Russian	16	24	4
1316	Red Saa	17	....	7
1317	Red Velvet	16	20	2
1318	Rice	16	20	4
1319	Rickenbrode	17	20	2
1320	Rocky Mountain	25	42	9
1321	Rogers	17	22	4
1322	Royal Australian	16	19	8
1323	Russian No. 2	17	25	9
1324	Sandomirka	17	21	5
1325	Scotch Brown	20	25	4
1326	Scott	20	....	4
1327	Scott's Bearded	20	....	7
1328	" Smooth	19	26	5
1329	Shaeffer	16	20	2
1330	Shumaker	15	21	3
1331	Siberian	15	21	3
1332	Sibley's Hybrid	16	....	4
1333	Small Frame	17	22	2
1334	Southern Amber	17	25	3
1335	Square Head	20	....	5
1336	Swamp	17	26	7
1337	Tappahannock	22	....	8
1338	Tasmanian Red	18	38	7
1339	Tennessee Amber	22	60	8
1340	Theiss	19	....	5
1341	Travis' Centennial	18	22	2
1342	Treadwell Bearded	17	22	2
1343	" Smooth	17	21	3
1344	Tuscan Amber	17	21	2
1345	Valley	17	21	2
1346	Washington	15	18	1
1347	White Eldorado	15	19	3
1348	" Mountain	16	19	2

TABLE I.—Continued.

Test number.	Varieties.	First seed sprouted—hours.	Half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.
1349	White Rogers	15	19	2	98
1350	" Rose	15	18	3	94
1351	" Velvet	18	21	3	100
1352	Winter Pearl	17	20	3	100
1353	Wysor's Eureka	19	....	7	97
1354	Yellow Missouri	18	21	2	100
1355	York White Chaff	17	22	5	98
1356	Wild Goose	17	23	2	100
1357	Zimmerman	18	23	2	100
1412	Ashburn	16	20	5	94
1413	Badger	16	20	2	84
1414	Barnes	15	20	2	88
1415	Gold Dust	15	20	3	79
1416	Golden Russia	15	18	2	93
1417	Imler's Amber	16	19	3	98
1418	Long Berry	15	18	2	96
1419	McCracken	17	21	6	100
1420	Menonnite	17	....	10	75
1421	Oster's Amber	16	19	6	96
1422	Patagonian Tr'go	16	18	2	99
1423	Todd	15	20	6	96

SELECTION OF EARS.

Ears were selected as last year—the largest, medium and smallest of each variety—and tested to compare the vitality of each selection. The wheat was all of a much better quality than last year and shows much less variation in vitality, both in the different varieties and in the different classes. For comparison of the different kinds, the results are compiled in the following—

SUMMARY TO TABLE II.

Class of wheat.	Average per cent. germinated.			
	Selected ears.	Average ears.	Smallest ears.	Average of all ears.
Red varieties	98.7	96.9	94.0	96.5
White varieties	97.2	98.6	96.4	97.4
Bearded varieties	99.8	99.0	98.3	99.0
Smooth varieties	97.1	98.0	93.8	96.3
All varieties	97.9	98.3	94.7	96.98

The difference in vitality in the different selections of ears is shown more plainly by comparing the number of tests in each case in which every grain sprouted. Thus, of the selected ears, every kernel sprouted in 63.1 per cent. of the tests; of the medium or average sized ears, in 52.6 per cent. of the samples every grain germinated; but of the smallest ears, all sprouted of only 36.8 per cent. of the tests. The average for all tests in which every seed germinated is 50.9 per cent.

In the table, the column "Size of ears," refers to the selection of ears. "L" means that the ears from which the grain used in the test were taken, were selected as the best in the plot; "M" was from medium or average sized ears, and "S" the smallest ears in the plot. In the last column are given the averages for the large, medium and small ears of each variety taken together. The remainder of the table is the same as explained for Table I.

SEED TESTS.—TABLE II.—SELECTION OF EARS IN VARIETIES OF WHEAT, 1884.

Test number.	Variety.	Size of ears.	First seed sprouted—hours.	One-half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Average sprouted from all ears—per cent.
1201	Australian	L	17	24	2	98	98.0
1202	"	M	17	23	3	100	
1203	"	S	18	....	3	96	
1204	Clawson	L	20	23	3	98	98.7
1205	"	M	19	23	2	100	
1206	"	S	18	22	2	98	
1207	Cornell No 2	L	15	21	2	100	98.7
1208	"	M	17	22	2	96	
1209	"	S	17	21	2	100	
1210	Finley	L	23	46	8	100	96.7
1211	"	M	....	70	9	96	
1212	"	S	....	70	9	94	
1213	Fultz X Clawson	L	18	22	2	100	100.0
1214	"	M	18	22	2	100	
1215	"	S	17	21	2	100	
1216	Golden Drop	L	21	....	2	100	98.0
1217	"	M	21	....	3	100	
1218	"	S	21	46	3	94	
1219	Grecian	L	20	24	3	100	100.0
1220	"	M	19	24	2	100	
1221	"	S	19	24	5	100	
1222	Lancaster	L	17	24	2	100	98.7
1223	"	M	23	44	4	96	
1224	"	S	24	44	4	100	
1225	Lincoln	L	18	22	5	98	95.3
1226	"	M	18	22	2	98	
1227	"	S	18	22	6	90	

TABLE II.—Continued.

Test number.	Variety.	Size of ears.	First seed sprouted—hours.	One-half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Average sprouted from all ears—per cent.
1228	Martin's Amber	L	22	26	3	98	96.0
1229	"	M	22	26	3	98	
1230	"	S	22	26	5	92	
1231	Red Chaff	L	....	41	5	96	91.7
1232	"	M	22	26	6	100	
1233	"	S	22	70	8	78	
1234	Roscoe	L	17	22	3	100	98.7
1235	"	M	17	24	3	100	
1236	"	S	17	22	3	96	
1237	Silver Chaff	L	20	42	3	98	96.7
1238	"	M	21	28	3	96	
1239	"	S	21	24	3	96	
1240	Smith's Improved	L	19	25	3	100	100.0
1241	"	M	19	23	3	100	
1242	"	S	19	25	3	100	
1243	Velvet Chaff	L	20	30	3	100	99.3
1244	"	M	21	39	3	98	
1245	"	S	21	38	3	100	
1246	Washington Glass	L	18	28	4	80	92.0
1247	"	M	18	21	2	98	
1248	"	S	18	21	2	98	
1249	Wayne County Select	L	18	20	2	100	98.0
1250	"	M	18	22	4	100	
1251	"	S	19	40	4	94	
1252	White Blue Stem	L	18	21	2	100	100.0
1253	"	M	18	21	2	100	
1254	"	S	18	22	4	100	
1255	Yellow Blue Stem	L	22	....	5	94	90.0
1256	"	M	29	66	6	92	
1257	"	S	23	....	6	84	

In table III are given the results of tests of varieties in selection of ears, harvest of 1883.

A part of each was a sample tested in the fall of 1883, and the results published in the Report of last year, 1883, page 178. Although there appears to be an increase in vitality in some of the varieties, there is a slight decrease in the per cent. of the whole, the average for 1883 being 90.09 per cent., while for 1884 it is 87.89 per cent.

The increased per cent. that germinated in some varieties is probably due to an improvement in the condition under which the tests were made, and we may assume that the per cent. of germination for all ths specimens is raised correspondingly above what it would be under the conditions of the year The explanation given for the preceding table applies as well to this.

SEED TESTS—TABLE III.—SELECTION OF EARS IN VARIETIES OF —HARVESTED 1883, TESTED FALL OF 1884.

Test number.	Varieties.	Size of ears.	First seed sprouted—hours.	One-half germinated seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.
1358	Australian	L	16	19	2	94
1359	"	M	16	19	2	98
1360	"	S	16	19	2	100
1361	Clawson	L	16	20	1	46
1362	"	M	16	19	4	92
1363	"	S	16	20	4	80
1364	Cornell, No. 2	L	16	19	4	76
1365	"	M	16	19	4	70
1366	"	S	16	20	2	88
1367	Finley	L	16	21	2	88
1368	"	M	16	20	4	92
1369	"	S	17	21	2	100
1370	Fultz X Clawson	L	16	19	2	88
1371	"	M	16	19	2	88
1372	"	S	15	20	2	93
1373	Golden Drop	L	16	20	2	100
1374	"	M	16	20	2	100
1375	"	S	16	20	2	100
1376	Grecian	L	16	19	3	88
1377	"	M	16	19	5	86
1378	"	S	16	19	3	76
1379	Lancaster	L	16	18	1	90
1380	"	M	16	19	1	98
1381	"	S	16	18	1	100
1382	Lincoln	L	17	....	5	52
1383	"	M	16	19	5	68
1384	"	S	16	19	3	84
1385	Martin's Amber	L	16	19	5	76
1386	"	M	16	20	3	92
1387	"	S	16	19	3	96
1388	Red Chaff	L	17	22	5	94
1389	"	M	17	20	2	96
1390	"	S	18	20	1	93
1391	Roscoe	L	16	19	5	86
1392	"	M	16	19	3	86
1393	Silver Chaff	L	18	20	3	82
1394	"	M	17	21	3	90
1395	"	S	16	19	3	70
1396	Small Frame	L	19	22	3	94
1397	"	M	18	22	3	98
1398	"	S	22	22	3	100
1399	Smith's Improved	L	17	....	3	82
1400	"	M	17	23	3	76
1401	"	S	16	19	3	76

TABLE III.—Continued.

Test number.	Variety.	Size of ears.	First seeds sprouted—hours.	One-half germinated seeds sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Average sprouted from all ears—per cent.
1402	Velvet Chaff	L	18	23	3	100	100.0
1403	"	M	18	22	3	100	
1404	Washington Glass	L	17	19	2	58	72.0
1405	"	M	16	18	2	86	
1406	White Blue Stem	L	16	18	1	100	100.0
1407	"	M	16	18	1	100	
1408	"	S	16	18	2	100	
1409	Yellow Blue Stem	L	18	21	1	100	96.7
1410	"	M	17	20	2	90	
1411	"	S	17	19	1	100	

A comparison of the vitality of wheat, as shown in Tables II and III, and of same varieties tested in 1883, is given in Table IV. This table shows plainly the superiority, so far as vitality is concerned, of the crop of '84 over that of '83. The first column after the name of the variety shows whether the sample tested was taken from large selected, medium, or small ears. In the next column is given the per cent. germinated of the crop of '83, tested that fall. The next column the same for the crop of '84. The second column from the right gives the results of tests, made in 1884, of grain harvested in 1883. The averages given in the last column on the right are only of the tests made the year harvested, as given in the third and fourth columns from the right. This column serves as a comparison of the average vitality of the different varieties for two successive harvests.

SEED TESTS.—TABLE IV.—SELECTION OF EARS IN VARIETIES OF WHEAT—COMPARISON OF TWO YEARS' TESTS.

Variety.	Size of ears.	Germinated—per cent. Harvest 1883, tested 1883.	Harvest 1884, tested 1884.	Harvest 1883, tested 1884.	Average of all ears 1883–84.
Australian	L.	90	98	94	96.4
"	M.	94	100	98	
"	S.	100	96	100	
Clawson	L.	94	98	46	94.0
"	M.	84	100	92	
"	S.	90	98	80	
Cornell No. 2	L.	82	100	76	91.0
" "	M.	84	96	70	
" "	S.	84	100	88	
Finley	L.	92	100	88	94.7
"	M.	94	100	92	
"	S.	92	96	100	
Fultz X Clawson	L.	92	100	88	95.0
" "	M.	88	100	88	
" "	S.	90	100	93	
Golden Drop	L.	100	100	100	99.0
" "	M.	100	100	100	
" "	S.	100	94	100	
Grecian	L.	92	100	88	93.0
"	M.	78	100	86	
"	S.	88	100	76	
Lancaster	L.	90	100	90	96.7
"	M.	96	96	98	
"	S.	98	100	100	
Lincoln	L.	58	98	52	79.3
"	M.	52	98	68	
"	S.	80	90	84	
Martin's Amber	L.	88	98	76	94.7
" "	M.	90	98	92	
" "	S.	96	92	96	
Red Chaff	L.	86	96	94	89.5
"	M.	88	100	96	
"	S.	88	78	93	
Roscoe	L.	86	100	86	92.4
"	M.	80	100	86	
"	S.	92	96	....	
Silver Chaff	L.	74	98	82	91.4
"	M.	86	96	90	
"	S.	98	96	70	
Small Frame	L.	96	....	94	
" "	M.	98	....	98	
" "	S.	96	....	100	
Smith's Improved	L.	78	100	82	90.4
" "	M.	82	100	76	
" "	S.	82	100	76	
Velvet Chaff	L.	100	100	100	99.7
"	M.	100	98	100	
"	S.	100	100	....	

TABLE IV.—Continued.

Variety.	Size of ears.	Germinated—per cent.			
		Harvest 1883, tested 1883.	Harvest 1884, tested 1884.	Harvest 1883, tested 1884.	Average of all ears 1883–84.
Washington Glass	L.	74	80	58	85.0
" "	M.	90	98	86	
" "	S.	70	98	....	
White Blue Stem	L.	100	100	100	99.7
" "	M.	100	100	100	
" "	S.	98	100	100	
Yellow Blue Stem	L.	98	94	100	93.7
" "	M.	94	92	90	
" "	S.	100	84	100	

MISCELLANEOUS.

The varieties of seeds used in experimental work were tested as far as possible. The results are given in Table V. Most of the seeds came direct from the seed merchants, named in the third column. Those marked with a star (*) were purchased from various grocerymen in Columbus, Ohio, the packets coming originally from the seedsmen named in the table. The tests of seeds from commission men, when compared with those of the seedsmen, show very conclusively that it is better to procure seeds from the growers, or from seedsmen direct; for, in nearly every instance, those from the grocerymen are *not* as good as those from seedsmen. This may be seen at a glance in the table given below. Tests of seeds grown in 1883, and published in the Report for 1883, are included in this table of comparison.

This table shows that a much larger per cent. germinated of seeds from the seedsmen, than of commission seeds from grocerymen. Thus of seventy tests of cabbage seeds from the seedsmen, an average of 85.81 per cent. germinated; while of fifteen tests from grocerymen, only 34.80 per cent. germinated, a difference of 50.51 per cent. in favor of the former, or making a paper of cabbage seeds from the seedsmen worth nearly two and a half papers commission seeds. In every variety the average vitality was greatest where the seeds were from seedsmen.

COMPARISON OF THE VITALITY OF SEEDS DIRECT FROM SEE WITH COMMISSION SEED FROM GROCERYMEN.

Kind of seed.	From seedsmen.		From grocer	
	Number of tests.	Germinated —per cent.	Number of tests.	Ger —p
Cabbage	70	85.31	15	
Cauliflower	12	76.83	2	
Cucumber	1	80.00	2	
Carrot	16	46.81	2	
Radish	23	66.52	4	
Ruta Baga	4	96.50	2	
Tomato	30	76.47	4	

Tests in the following table marked with a dagger (†) were of se cured the year before, and are not included in the above table of com Comparing the fresh seeds, or those one year old, with those two ye shows a loss of vitality by age. Thus, eleven tests of cauliflowe bought for fresh, gave an average 82.91 per cent. germinated; but six seeds one year older, gave an average of only 60.67 per cent. germina

SEED TESTS.—TABLE V.—VARIETIES USED IN EXPERIMENTAL

Test number.	Variety.	From.
	MELON—CITRON.	
934	California	D. Landreth & Sons, Philadelphia
935	Montreal	same
936	Extra Early	same
937	Surprise	same
938	Jenny Lind	same
	MELON—WATER.	
939	Dark Icing	D. Landreth & Sons, Philadelphia
940	Ice Cream	same
941	Landreth's Boss	same
	SQUASH.	
942	White Turban	D. Landreth & Sons, Philadelphia

TABLE V.—Continued.

Test number.	Variety.	From.	Germinated—per cent.
	PUMPKIN.		
944	Yellow Mammoth	Vilmorin, Andrieux & Co., Paris, France	20
945	Mammoth Etampes	same	20
	CUCUMBER.		
943	White Slicing	D. Landreth & Sons	80
*946	Early White Spine	D. M. Ferry & Co., Detroit Mich	30
*947	London Long Green	same	66
	TEOSINTE.		
948	*Reana luxurians*	J. J. H. Gregory, Marblehead, Mass	70
949	*Reana luxarians*	Vilmorin, Andrieux & Co	82
	DOURA.		
950	Branching	J. J. H. Gregory	80
	RADISH.		
*973	Early Long Scarlet	D. M. Ferry & Co	8
*974	Early White Turnip	same	74
*975	Early White Turnip	Hiram Sibley & Co., Rochester, N. Y.	6
*976	Early White Turnip	same	28
977	French Breakfast	same	4
	KALE.		
867	Green Curled Dwarf	Vilmorin, Andrieux & Co	70
922	Purple Curled Dwarf	same	94
923	Morbach Curled	same	84
	BROCCOLI.		
†877	Cabbage	Hiram Sibley & Co	58
988	Roseoff	Vilmorin, Andrieux & Co	88
	CAULIFLOWER.		
†878	Erfurt Early Dwarf	B. K. Bliss & Sons, New York	76
†879	Erfurt Early Dwarf	Peter Henterson & Co., New York	54
†880	Erfurt Early Dwarf	Hiram Sibley & Co	80
†881	Angiers	same	46
†882	Early Snowball	J. J. H. Gregory	80
†883	Extra Early Paris	D. M. Ferry & Co	28
924	Large Short-stemed	Vilmorin, Andrieux & Co	92
978	Early London	D. Landreth & Sons	22
979	Landreth's First	same	92
980	Early Snowball	Peter Henderson & Co	78
981	Early Snowball	D. M. Ferry & Co	98
982	Early Dutch	Vilmorin, Andrieux & Co	74
983	Early Dwarf Erfurt	same	92
984	Early Imperial	same	88

* Commission seed † Purchased previous year.

TABLE V.—Continued.

Test number.	Variety.	From.
	CAULIFLOWER—Continued.	
985	Half Early Paris	Vilmorin, Andrieux & Co
986	Large Angiers	same
986	Walcheren	same
*989	Early Paris	D. M. Ferry & Co
*990	Early Erfurt	same
	CABBAGE.	
*991	Early York	D. M. Ferry & Co
*992	Early Winningstadt	same
*993	Early Drumhead	same
*994	Premium Large Drumhead	same
*995	Drumhead Savoy	same
*996	Drumhead Savoy	Hiram Sibley & Co
*997	Green Globe Savoy	same
*998	Early Jersey Wakefield	same
*999	Early Winningstadt	same
*1000	Early York	same
*1001	Early Drumhead	same
*1002	Late Drumhead	same
	KOHL RABI.	
1003	Early Smooth Purple	Hiram Sibley & Co.
	INDIAN CORN.	
1004	Leaming (tip)	Ohio Agricultural Experiment Statio
1005	Leaming (middle)	same
1006	Leaming (butt)	same
1007	White Dent (tip)	same
1008	White Dent (middle)	same
1009	White Dent (butt)	same
1010	Wright's Golden	same
1011	Taylor	S. S. Devol, Marietta, O
	TOMATO.	
*1075	Smooth Red	Hiram Sibley & Co.
*1076	Early Red	same
*1077	Large Red	D. M. Ferry & Co
*1078	Trophy	same
1079	Trophy	Vilmorin, Andrieux & Co
1080	Trophy	A. W. Livingston's Sons, Columbus,
1081	Acme	same
1082	Alpha	Frank Ford, Ravenna, O
1083	Alpha	J. J. H. Gregory
1084	Perfection	A. W. Livingston's Sons
1085	Perfection	D. Landreth & Sons
1086	Paragon	same
1087	Paragon	A. W. Livingston's Sons
1088	Favorite	same
1089	Favorite	same

TABLE V.—Continued.

Test number.	Variety.	From.	Germinated—per cent.
	TOMATO—Continued.		
1090	Rochester Favorite	J. J. H. Gregory	16
1091	Mayflower	same	24
1092	Essex Hybrid	Peter Henderson & Co	68
1093	Island Beauty	same	38
1094	Hathaway's Excelsior	same	90
1095	Hathaway's Excelsior	A. W. Livingston's Sons	94
1096	Golden Queen	same	92
1097	Canada Victor	same	16
1098	Canada Victor	J. J. H. Gregory	84
1099	Canada Victor	same	98
1100	New Red Apple	same	66
1101	Hubbard's Curled Leaf	Hiram Sibley & Co	26
1102	Hubbard's Curled Leaf	Vilmorin, Andrieux & Co	98
1103	Large Red	same	94
1104	Dwarf Red	same	98
1105	Early Conqueror	D. M. Ferry & Co	86
1106	Hundred Days	same	100
1107	New Rare	Rural New-Yorker	94
	TURNIP.		
1108	Purple Top Munich	Peter Henderson & Co	98
1109	Red Top Strap Leaved	same	99
1110	Amber Globe	D. Landreth & Sons	96
1111	Golden Rose	B. K. Bliss & Sons	98
1112	Chirk Black Stone	Vilmorin, Andrieux & Co	94
1113	White Stubble	same	94
1114	White Am Stone	same	92
1115	Red Am. Stone	same	98
1116	White Cow-horn	same	100
1117	Purple Top Montmagny	same	100
1118	Purple Top Milan	same	98
1119	Yellow Finland	same	100
1120	White Hanover	same	98
1127	Pomeranean White	D. M. Ferry & Co	26
1128	Purple Top Strap Leaved	same	98
	RUTA BAGA.		
1121	White Smooth	Vilmorin, Andrieux & Co	98
1122	Champion Purple Top	same	98
1123	Green Top	same	100
1124	Bloomsdale Yellow	D. Landreth & Sons	90
*1125	Purple Top Yellow	D. M. Ferry & Co	60
*1126	Purple Top Yellow	Hiram Sibley & Co	32
	LETTUCE.		
1129	Early Prize Head	D. M. Ferry & Co	32
1230	The Deacon	Joseph Harris, Rochester, N. Y	88
1131	Tennis White Seeded	Peter Henderson & Co	92
1132	Salamander	same	40
1133	Green Fringed	same	84

TABLE V.—Continued.

Test number.	Variety.	From.
	LETTUCE—Continued.	
1134	Forcing	D. Landreth & Sons
1135	Bloomsdale Reliable	same
1136	Crown Winter Cabbage	Vilmorin, Andrieux & Co
1137	Summer White Stone	same
1138	White Tennis	same
1139	White Paris	same
1140	White Silesian	same
1141	Monstrous Crown	same
1142	Palestine	same
1143	Tom Thumb	same
1144	Marvel	same
1145	Hammersmith	same
1146	Neapolitan	same
1147	Curkish	same
1148	Red Edged Victoria	same
1149	Black Seeded Simpson	James Vick
	PEPPER.	
1150	Golden Dawn	Ohio Agricultural Experiment Statio
1151	Monstrous	same
1152	Spanish Mammoth	Vilmorin, Andrieux & Co
1153	Chili	same
1154	Long Red	same
1155	Cayenne	same
1156	Squash	same
	CARROT.	
*1157	Long Orange	D. M. Ferry & Co
*1158	Long Orange	Hiram Sibley & Co
1159	Half Long	same
1160	Danver's Half Long	D. Landreth & Sons
1161	Half Long	Jos. Harris
1162	Cretan Half Long	Vilmorin, Andrieux & Co
1163	Nantes Half Long	same
1164	Early Half Long	same
1165	Long Red	same
1166	Altringham	same
1167	St. Valery	same
1168	White Short Vosges	same
1169	Dutch Horn	same
1170	English Horn	same
1171	French Horn	same
1172	Long White	same
1173	Half Long Scarlet	same
1174	Early Forcing	same

OLD SEEDS.

A large number of varieties of flower seeds and a few of vegetable seeds, of various ages, were received from Mr. Waldo F. Brown, of Oxford, O. The results of these tests are shown in Tables VI and VII. In Table VII are given only those varieties of which none germinated, with the age of the seed. Table VI exhibits those varieties whose vitality was not entirely destroyed, together with the age of the seeds, the number of hours till the first seed germinated, number of days till the last seed germinated, and the per cent. of seed germinated.

SEED TESTS.—TABLE VI.—FLOWER AND VEGETABLE SEEDS OF VARIOUS AGES.

Test number.	Variety.	Age of seeds—years.	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.
	FLOWERS.				
1019	Cardiospermum	4	14	1	4
1025	Clarkia	3	96	2	6
1028	Convolvulus Minor	5	94	10	8
1030	Crepis	3	72	6	8
1035	Gaillardia	4	....	7	12
1037	Gompherna	4	....	7	36
1040	Heliotrope	3	96	7	8
1043	Lupinus	3	72	3	4
1044	Malope	4	120	5	4
1056	Solanum	3	....	....	14
1059	Specularia	4	....	....	8
	VEGETABLES.				
1066	Celery, Sandringham	3	....	....	0
1067	Cucumber, Gherkin	2	34	4	48
1068	Cotton	2	....	4	56
1069	Okra	3	33	15	60
1070	Onion, White Silverskin	2	46	12	54
1071	Tomato, Alpha	4	....	9	50
1072	Beet, Bassano	3	38	12	20
1073	Beet, White Sugar	5	....	16	16
1074	Beet, Spinach	3	38	7	52

SEED TESTS.—TABLE VII.—OLD FLOWER SEEDS THAT FAILED TO GERMINATE.

Test number.	Variety.	Age of seeds—years.	Test number.	Variety.	Age of seeds—years.
1012	Abronia	3	1041	Helipterum	4
1013	Acroclinium	4	1042	Lupinus	4
1014	“	3	1045	Maurandya	4
1015	Alonsoa	4	1046	Nemophila	4
1016	“	3	1047	Nigella	4
1017	Ammobium	4	1048	Œnother	4
1018	“	3	1049	Perilla	4
1020	Browallia	4	1050	Petunia	4
1021	Cacalia	5	1051	Rhodanthe	3
1022	Calandrinia	3	1052	Salpiglossis	4
1023	Callirhœ	3	1053	Scabiosa	4
1024	Clarkia	4	1054	“	3
1026	Columbine	4	1055	Solanum	4
1027	“	3	1057	Sweet Sultan	4
1029	Crepis	4	1058	Thunbergia	4
1031	Digitalis	4	1060	Verbena	4
1032	“	3	1061	Virginia Stock	4
1033	Erysimum	4	1062	Wall Flower	5
1034	Feverfew	4	1063	“	4
1036	Gilia	4	1064	Xeranthemum	4
1038	Godetia	4	1065	“	3
1039	Helichrysum	4			

It will be observed by comparing the tables that some of the varieties showed a little vitality at the age given in Table VI, but seeds of the same varieties one year older were entirely dead, thus giving the limit of age to which they may be kept, and some of them grow. All of them are, however, valueless for planting when they have attained the respective ages given, excepting, perhaps, Gompherna or globe amaranth. Of seeds of Clarkia that were three years old there were six in one hundred that grew; but seeds a year older were all dead and soon rotted. Crepis seeds three years old gave 8 per cent. sprouted; four years old, none sprouted. Lupine at three years showed a vitality equal to 4 per cent.; at four years none germinated. Solanum at three years fourteen in a hundred germinated; at four years all failed to sprout. The germinator was kept at a temperature of 84° to 93° Fahrenheit. The vegetable seeds, given in the latter part of Table VI, show greater vitality.

Just how long seeds kept under ordinary circumstances will retain their vitality, can only be determined by a long series of tests. Investigations in this direction have already been begun.

DIRECTIONS FOR SAMPLING AND SENDING SEEDS.

Care should be taken to have the sample of seed a fair average of the whole amount from which it is taken.

Of the smaller field seeds, such as wheat, clover, timothy, etc., about two ounces should be sent; of garden vegetables half an ounce; of corn, one hundred and five ears should be taken from all parts of the bin and one kernel taken from the middle of each ear; of shelled corn send two hundred kernels.

These samples should be sent by mail, in *stout* paper bags or boxes, or cloth bags, securely tied, but not sealed. The name of the sender should be written on the outside of each package with "from" written above it; there should be no writting inside of the package. Under these conditions the postage is one cent for each ounce or fraction thereof, *which must be fully prepaid or the package will not be forwarded.* A letter should accompany the package, giving the name of the variety of seed sent, the year in which it was grown, by whom it was grown or from whom purchased, and other points of interest. In the case of corn, it should be stated how the corn was cured, and how kept during winter.

The report on the germination of a sample should not be expected sooner than two weeks after the sample is sent. As soon as completed each test is reported to the sender on the following form:

REPORT OF SEED TEST.

Columbus, Ohio, ..., 188...

Station Test No. ....

Received ...., 188...

Variety ....

Sample from ....

Grown by ....

Per cent. by wieght of pure seed, ...

Per cent. by weight of impurities, ...

Per cent. of seed sprouted, ...

Per cent. of seed remaining apparently sound, ...

First seed sprouted in .... **hours.**

Of germinated seed, half sprouted in .... **hours.**

Last seed sprouted in .... **days.**

Test lasted .... **days.**

.... *Bontanist.*

.... *Director.*

METEOROLOGICAL REPORT.

W. B. ALWOOD.

This report is compiled from the monthly reports of the Ohio Meteorological Bureau, and the daily observations taken at the Station. The State Bureau consists of thirty-five local stations distributed quite evenly over the State. These notes cover the twelve months ending October 31, 1884.

Of the year as a whole it can be said that the mean temperature was a little more than 2° higher than for 1883, and the range was very much greater. The highest point reached was 99°, being 1° higher than the maximum for 1883, while the lowest was 34° below zero, the minimum for 1883 being only 17.5° below zero. The range for the year is therefore 133° against a range of 115.5° during 1883.

There was a considerable deficiency in the rainfall during the year over the greater part of the State. The average rainfall for the year was 38.57 inches, while for 1883 it was 41.49 inches, a difference of 2.92 inches. The average deficiency was slight, but the distribution of rainfall was such that some sections had abundance, while others suffered severely.

The following summary gives the average conditions which prevailed over the State:

NOVEMBER, 1883.

Mean temperature for this month was 1.6° above the normal mean for November, which is 41.6°. The mean rainfall was also slightly in excess of the normal being 3.51 inches, while the normal is 3.26 inches. The first fifteen days were quite cold and severe, but the latter part of the month was warm and pleasant.

DECEMBER, 1883.

During this month the weather was rather mild for December, showing a mean temperature of 33.4°, being slightly above the normal mean for this month which is 32.02°. The minimum for the State was only 5.4° below zero, while for the previous year, 1882, it was 16.4° below zero. The rainfall was 3.9 inches, somewhat in excess of the normal which is 3.25 inches.

JANUARY, 1884.

This month was exceptional for the extreme low temperatures recorded. The first cold wave culminated on the 6th, when the mean temperature for the State was 15.8° below zero, the second on the 21st with a mean of 11.1° below zero, and the third on the 26th, when a mean temperature of 19.8° below zero was reached. These are means for the entire State on the days mentioned. The mean for the month was 19.4°, nearly five degrees below the previous year.

The precipitation for the month was 2.72 inches, being principally snow, which was quite deep in places.

FEBRUARY, 1884.

The mean temperature was 33.8° more than 3° above the mean for February last year. The lowest temperature reported for the State was 8.1° below zero and the highest 70°.

The rainfall was excessive, especially in the southern part of the State, the mean being 5.52 inches against a normal of 2.51 inches for this month.

The floods along the Ohio River and tributaries surpassed those of the previous year, the water at Cincinnati reached 71 ft. and ¾ in. There were several quite warm days during the month, the temperature here at the Station reaching 65° on one occasion.

MARCH, 1884.

The mean temperature for the State was 37.5°, and for this Station 38°, only 4° above February, and the minimum being some lower, reaching 7° below zero on the 4th. This severe freeze after the previous warm days did considerable injury to small fruit, such as had survived the extreme low temperature of January.

The mean rainfall for the month was 3.51 inches, which is about the normal for March.

APRIL, 1884.

The mean temperature for this month was just 10° higher than for March, being 47.5°, this is about 3° less than the normal mean for April. The mean precipitation was only 2.01 inches being about 1.5 inches less than the normal mean, these two facts of low temperature and slight rainfall doubtless had important bearing on the starting of the spring crops.

MAY, 1884.

This month shows a mean temperature of 60.7°, three-tenths of a degree less than the normal for May. The mean rainfall was 3.87 inches, which is nearly the normal mean for May.

This was so distributed through the month as to favor farming op
and the month closed with rather bright prospects. White frosts were
on the 29th and 30th, but the injury was slight, except killing a few st
blossoms and checking the growth of planted corn.

JUNE, 1884.

The mean temperature was 71.1° slightly above the normal, the me
fall was 2.96 inches, considerably below the normal for June, whic
inches. The rainfall here at the Station for the month was but 1.11 in
shows a very great discrepancy in amount of moisture considering that
cipitation had been below the normal for some months. The heavy
for the month were mostly in Southern Ohio.

The result of these climatic conditions here, was a very poor g
spring crops except in favored localities, but winter wheat grew spl
stood up well and ripened early.

JULY, 1884.

A very severe drouth prevailed during the greater part of the
over all parts of the State, but was broken by quite frequent and gene
during the last ten days, however a strip of territory lying contiguou
Station received but part of these general storms. The mean for the S
3 83 inches, being slightly above the normal for July. Here the prec
was but 2.23 inches, being considerably below the normal, the sam
true of other Stations in this vicinity. These rains to a great extent s
corn crop. The mean temperature was 71.5° some 3° below the norm
for July.

AUGUST, 1884.

The mean temperature was 70.8° being 1.24° below normal mean
gust. The remarkable feature of the month was the small rainfall, t
for the State being only 1.45 inches, 2.31 inches below the normal me
northern and southern portions of the State received more than the cen
tion. The precipitation at the Station was only .45 of an inch.

The rainfall at this point for the four months, May, June, July and
was only 8.13 inches, but little more than one-half the normal amoun
month was noted for cold nights; frost occuring in many parts of t
at three different times, but not sufficient to injure the crops.

SEPTEMBER, 1884.

The month was remarkable for the high temperature maintained du
entire length.

The mean temperature 69.4° is about 4° above the normal mean for September. The severe drouth continued up to about the 23, when the rainfall was excessive up to the end of the month, bringing the mean up to 3.36 inches, only .27 below the normal mean. Slight frosts occurred throughout the State on the 14th and 19th.

OCTOBER, 1884.

The mean temperature was 56.3° being 4° higher than the normal mean. It is somewhat remarkable that the maximum temperature of the year 99° should have been recorded during this month. The mean rainfall was 1.88 inches, about one-third less than the normal amount for the month.

The following table presents a summary for the year:

STATE SUMMARY FOR THE YEAR BEGINNING NOVEMBER 1, 1883, AND ENDING OCTOBER 31, 1884.

Month.	Mean temperature.	Highest temperature.	Date.	Lowest temperature.	Date.	Range of temperature.	Mean daily range of temperature.	Greatest daily range of temperature.	Date.	Least daily range of temperature.	Date.	Total rainfall for month.	Prevailing direction of wind.
November	43.2	75.0	9th.	5.7	16th.	69.3	18.4	38.0	17th.	4.0	12th.	3.51	S.W.
December	32.4	68.0	13th.	—5.4	17th.	73.4	17.1	39.5	6th.	0.5	23d.	3.95	S.W.
January	19.4	59.7	30th.	—34.0	25th.	93.7	18.9	48.0	25th.	2.1	1st.	2.72	S.W.
February	33.8	70.0	5th.	—8.1	28th.	78.1	17.2	41.5	14th.	1.1	6th.	5.52	W.
March	37.5	74.0	28&29	—10.5	4th.	84.5	17.6	40.0	22d.	1.5	12th.	7.51	S.W.
April	47.5	84.0	30th.	20.0	7th.	64.0	19.9	44.5	30th.	5.5	2&22	2.01	W.
May	60.4	90.0	22d.	28.5	29th.	61.5	22.2	42.0	22d.	5.1	27th.	3.87	S.W.
June	71.1	98.7	23d.	40.0	10th.	58.7	22.7	41.0	2d.	5.0	10&25	2.96	N.E.
July	71.5	96.0	24th.	41.0	21st.	55.0	21.7	49.5	22d.	3.0	19th.	3.83	N.W.
August	70.8	98.0	20th.	38.0	27th.	60.0	23.7	44.0	26th.	6.8	28th.	1.45	S.W.
September	69.4	99.0	28th.	30.0	21st.	69.0	23.8	50.0	5th.	5.5	29th.	3.36	S.W.
October	56.3	99.0	1st.	18.0	24th.	81.0	21.4	48.0	16th.	3.4	14th.	1.88	S.W.

Highest temperature .... 99 degrees.
Lowest " .... —34 "
Range of " .... 133 "
Mean daily range of temperature .... 20 "

Number of clear days 118.9
" fair " 121.0
" cloudy " 126.1
" days on which rain fell 143.7

SUMMARY OF OBSERVATIONS AT THIS STATION FOR YEAR ENDING OCTOBER 31, 1884.

Month.	Mean temperature.	Highest temperature.	Date.	Lowest temperature.	Date.	Range of temperature.	Mean daily range of temperature.	Greatest daily range of temperature.	Date.	Least daily range of temperature.	Date.	Total rainfall for month.	Prevailing direction of wind.
November	41.8	71.0	9th.	9.0	16th.	62.0	23.2	34.0	5th.	7.0	30th.	3.87	N.W.
December	30.6	58.2	8th.	—1.0	22d.	57.2	19.0	34.0	6th.	7.0	30th.	4.97	N.W.
January	16.8	47.3	31st.	—32.0	25th.	79.3	21.3	42.0	25th.	6.0	1st.	2.77	S.W.
February	34.0	65.0	12th.	—5.0	29th.	70.0	17.0	35.0	20th.	4.0	25th.	5.29	S.
March	38.0	70.0	28th.	—7.0	4th.	77.0	18.3	35.0	30th.	5.3	9th.	4.10	N.W.
April	48.5	79.0	30th.	21.0	7th.	58.0	25.9	43.0	28th.	12.0	9th.	2.40	N.W.
May	59.3	86.0	22d.	32.0	29th.	54.0	26.5	38.0	31st.	11.0	23d.	4.34	S.W.
June	71.1	96.5	22d.	49.0	1st.	47.5	28.3	37.5	29th.	16.0	14th.	1.11	S.E.
July	71.6	94.0	22d.	44.0	21st.	50.0	28.9	49.5	22d.	10.5	28th.	2.23	N.W.
August	71.6	97.0	20th.	41.0	11th.	56.0	29.7	44.0	26th.	20.0	4th.	.45	S.W.
September	69.0	96.5	8th.	33.8	21st.	62.7	32.0	47.5	15th.	12.0	27th.	4.23	S.W.
October	54.6	91.0	2d.	19.0	24th.	72.0	26.6	42.0	19th.	13.0	27th.	1.49	W.

Mean temperature for year	50.6 degrees.	Greatest daily range of temperature for year	49.5 degrees.
Highest " "	97.0 "	Least " " "	4.0 "
Lowest " "	—32.0 "	Total rainfall	37.25 inches.
Range " "	129.0 "	Prevailing wind	N. W.
Mean daily range of temperature for year	24.7 "		

MEAN TEMPERATURE AND RAINFALL FOR THE YEAR ENDING OCTOBER 31, 1881, WITH NORMAL MEAN OF EACH

	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.
	Degrees.	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*
Mean temperature for the State	43.2	32.4	19.4	33.8	37.5	47.5	60.4	71.1	71.5	70.8	69.4	56.3
Mean temperature at this Station	41.8	30.6	16.8	34.0	38.0	48.5	59.3	71.1	71.6	71.6	69.0	54.6
Normal mean for the State.......	41.6	32.0	28.9	32.3	38.2	50.5	60.7	70 4	74.5	72.2	65.4	52.3
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Mean rainfall for the State	3.51	3.95	2.72	5.52	7.51	2.01	3.87	2.96	3.83	1.45	3.36	1.88
Mean rainfall for this Station...	3.87	4.97	2.77	5.29	4.10	2.40	4.34	1.11	2.23	0.45	4.23	1.49
Normal mean for the State	3.26	3.24	2.65	2.51	3.37	3.49	3.85	4.02	3.90	3.76	3.63	2.73

Mean temperature for the State.................. 51.1 Degrees.
" " at this Station .... 50.6 "

Mean rainfall for the year .... 38.7 inches.
" " this Station .... 37.25 "

The foregoing table (page 210) gives a comparison of the temperature and rainfall at this Station, with the average for the State, and also with the normal mean of the State. The normal means of temperature and rainfall, as mentioned in these notes, are taken from observations covering a long period of years.

In closing these notes we would suggest that many of the farmers of Ohio might make meteorological observations, which would be of interest, and in many cases of profit. Especially is this true with regard to temperature and rainfall. A very simple outfit would enable the average farmer to take these with a considerable degree of accuracy, and while it is difficult to point out just where the money value of these would result to him, yet they would accumulate material for thought and study, and would add a new subject of interest to the routine duties of farm life. All the data thus accumulated would be of direct scientific value.

The monthly reports of the Ohio Meteorological Bureau may be had by writing to the Bureau, at Columbus, Ohio.

Observations for the 13th District are made at the Experiment Station.

REPORT OF CHEMIST.

The amount of material to be prepared by the chemist of the Station for the present report is necessarily very limited, owing to the lateness of the appointment, and to the fact that at first no suitable appliances for chemical investigation were at hand. In addition to the report of the analyses which have been made, it was thought advisable to call attention to a few facts, which will show the relation of chemistry to agriculture, and which at the present time are of especial interest to the farmer.

ANALYSES OF SUGAR BEETS AND CARROTS.

Three varieties of sugar beets were raised the past season on the University farm, for the purpose of feeding the dairy cows during winter. The principal variety sown was Lane's Imperial Sugar Beet. The two others, sown for the sake of comparison, were the Golden Globe and the Golden Tankard. The past summer being noted for its excessive drought in this section, it was desired to know what effect this weather might have upon the composition of the beets. It was also very desirable to know whether there was any difference in the feeding value of these varieties. As they were grown under exactly the same conditions, their comparative value as feeding stuffs could be definitely determined by a chemical analysis of each. An analysis was also made at the same time of a field of carrots grown by the Experiment Station for the purpose of feeding stock. The following table shows the results of the analyses of these roots:

	Imperial Sugar Beet.	Golden Globe Sugar Beet.	Golden Tankard Sugar Beet.	Carrot.
Water	87.24	89.78	90.76	86.52
Ash	0.93	0.93	0.92	1.05
Protein	1.76	1.78	1.89	0.84
Crude fiber	0.88	0.78	0.71	0.99
Nitrogen, free extract	9.13	6.68	5.67	10.40
Fat	0.06	0.05	0.05	0.20
Total dry organic matter	11.83	9.29	8.32	12.43

As will be seen from the table the carrots are the richest in dry organic matter. Of the three varieties of beets the Imperial Sugar Beet is a great deal the best. It also yielded the most per acre. From the extreme dryness of the season it was expected that the percentage of water would be low. In this, however, we were disappointed. On the other hand the percentage of protein or albuminoids is high, and hence the nutritive ratio (1:5.2) in the case of the Imperial Sugar Beet is a very narrow one for roots.

For the benefit of those who may desire to know the feeding value of the crop of beets, the following calculation is made:

Assuming protein and fat of equal money value, and the value of either four times as great as that of the carbhydrates, and estimating good timothy hay containing the following percentages of digestible nutrients, viz.: protein 5.8, carbhydrates 43.4, and fat 1.4, at $14.44 per ton, the feeding value of the sugar beet, according to analysis No. 1 given above, would be $3.44.

In spite of the excessive drought of the past season the yield of beets was twenty one bushel per acre. This would make, under the assumptions stated above, the crop of beets worth $72.24 per acre. The calculation here given does not include the difference in cost of production of hay and beets, nor the indirect advantage gained by feeding beets with dry food, especially to cows giving milk.

METHOD OF ANALYSIS.

In order to give an opportunity for an intelligent criticism of the analyses made, and also to aid those who may desire to make similar analyses, but have not the proper literature at hand, a brief description of the method followed is here given, in which, of course, no claim is made for originality.

About a dozen roots are selected, representing as near as possible, the whole crop in regard to size and appearance. These are freed from any adhering earthy matter, by washing under a tap and drying with a cloth. A longitudinal section is then made through the middle of each root and a thin slice cut from one of the halves. Five hundred grams of the slices thus prepared are weighed off, strung on a platinum wire, suspended in a drying oven and dried at 60 degrees Centigrade until they become brittle.

After allowing to remain for five or six hours at ordinary temperature, the dried slices are accurately weighed and then pulverized as rapidly as possible in an iron mortar. The pulverized mass is preserved in a dry, stoppered bottle for analysis. Of the powder there will be required: 1 gram for water and ash; 0.5 grams for protein; 4 grams for fat and fiber.

Water.

One gram for estimation of water is weighed off in a flat bottomed platinum dish and dried in an oven at 110 degrees Centigrade, until the weight is constant. From the loss of weight thus found, with that of the whole mass as determined above, the percentage of water is calculated.

Ash.

The residue, after the determination of water, is incinerated in the platinum dish at as low a temperature as possible until a white ash remains. The weight of ash is then determined and the percentage calculated.

Protein.

The 0.5 gram weighed off for this purpose is burned with soda lime. The Will's bulbs are charged with hydrochloric acid, diluted with an equal volume of water. After the combustion is completed the contents of the bulbs are transferred to a small porcelain dish and concentrated to a small volume on a water bath. After cooling, the liquid is filtered, in order to remove the greater part of the empyreumatic oils that may have been formed during the process of combustion. The filtrate is treated with an excess of platinic chloride and evaporated to dryness on a water bath. The residue is covered with alcohol and allowed to stand several hours, after which the ammonium platinic chloride is filtered off and washed with alcohol. The filter is then dried and ignited, the filter ash deducted, and from the weight of metallic platinum thus obtained, the percentage of nitrogen is calculated. By multiplying the nitrogen by 6.25 the percentage of protein is obtained.

Fat.

For the determination of fat a test tube about three-fourths of an inch in diameter and three inches in length is drawn out in the shape of a funnel at the bottom. A small filter paper is carefully adjusted in the bottom and moistened with ether. The four grams of the powder are transferred into the tube, and the tube thus charged, is suspended by means of a platinum wire into a wide mouthed flask of about 100 cubic centimeters capacity, so that the top of the test tube will be about three fourths of an inch below the mouth of the flask. From one-half to an ounce of pure anhydrous ether is then gradually poured through the tube, after which the flask is closed with a perforated cork, carrying a clean glass tube about one-fourth of an inch in diameter and five or six feet in length. The long tube being properly supported, the flask is placed on a water bath and heat applied. As the ether evaporates from the flask it is condensed in the long tube and drops back upon the mass to be extracted. The rapidity of the flow of ether can be controlled by regulating the heat. Two hours is usually enough for complete extraction. The tube is then withdrawn, the contents of the flask poured into a weighed beaker or capsule, the flask washed with pure ether, the ether evaporated, the residue dried at 100 degrees Centigrade for an hour and weighed. The weight thus obtained represents the fat, from which the percentage is calculated.

Fiber.

The test tube with its contents, after the extraction of fat is placed in a drying oven for a short time to expel the ether. The residue in the tube is washed into a large beaker; any particles adhering to the small filter is also separated by means of a wash bottle. The whole is diluted to about 200 c.c., to which 2 c. c. of strong sulphuric acid are added. The mixture is then boiled for half an hour, filtered, and thoroughly washed with hot water. The contents of the filter are again washed back into the beaker, and boiled for half an hour with 200 c. c. of water containing about one per cent. of caustic soda. The mixture is then filtered upon an equipoised filter, thoroughly washed at first with hot water, then with alcohol, and finally with ether. The filter and its contents together with the other equipoised filter are placed in a drying oven and dried at 110° C. From the weight thus obtained the small amount of ash determined by incineration is deducted, and the difference estimated as fiber.

The nitrogen free extract is found by difference.

DETERMINATION OF ORGANIC MATTER IN WATER.

The determination of organic matter in natural waters, that are used for domestic purposes, is of very great importance in a sanitary respect. Whenever there is a good reason for suspicion that a water of this kind is unduly contaminated with surface drainage, it should be subjected to examination, and the evil remedied if possible.

The following waters have been examined during the month of March, 1885, all from Columbus, O.:

	Organic matter in 1,000,000 parts of water—parts.
Well at University Dormitory	10.0
Spring on University Grounds	9.8
Well at 1212 North High street	37.0
Cistern at 1212 North High street	44.0
Well at 38 West McMillan avenue	21.0
Well at 29 West Eighth avenue	24.0
Well at 108 Starr avenue	9.8
Well at 36 Frambes' avenue	15.8
Hydrant at 33 West Eighth avenue	20.4
Well at University barn	19.0

If the limit (20 parts of organic matter to 1,000,000 parts of wate lished for good drinking water by the Sanitary Commission at Br number of years ago, be taken as a standard, it will be seen that all b of the waters examined would fall into this category. Each communi ever, should have its own standard of purity, depending upon the difficulty with which pure water can be obtained. A case of this l come under the experience of the writer, where the limit of organic c ation could be put as low as six parts in a million without great incon to anybody.

Attention is called to the cistern water, as it contains the most matter of the waters examined.

Although little importance can be attached to a single analysis of tl yet the result seems to corroborate the experience of the writer, obt the examination of cistern waters at other places.

Three cistern waters at Cairo, Illinois, contained respectively 43, 150 parts of organic matter in one million.

Out of 14 cistern waters examined in Champaign, Illinois, only t tained less than 20 parts of organic matter in a million. In the othe this contamination varied from 32 to 178 parts in one million.

Persons sending water from a distance for examination should sel specimens with great care. Either new bottles or such as contained but acids, which may be procured at drug stores, should be emplo these should be thoroughly rinsed with the water in question seve before filling. Glass stoppers are best; but if they cannot be had o corks should be used.

METHOD.

The method adopted for the determination of organic matter in w modification of the potassium permanganate method originated by F mer, and improved by Kubel. The modification consists in distin between the potassium permanganate consumed in oxidizing nitrites salts, etc., and that consumed in the oxidation of the organic matter.

Three solutions are employed: 1. Dilute sulphuric acid (1:4); 2. tion of 0.63 gram pure crystalized oxalic acid in one litre of redistille 3. A solution of 0.3 gram potassium permanganate in one litter of r water.

The permanganate solution is standardized by placing into a flas c. c. capacity 100 c. c. of redistilled water, 10 c. c. of the oxalic acid and 5 c. c. of the dilute sulphuric acid. The mixture is gently hea the permanganate solution added from a Guy Lussac burette, or on glass stop cock until the last drop produces a permanent coloratio number of c. c. of permanganate solution required will of course be in the neighborhood of ten.

The organic matter is determined as follows: The contents of the flask in which the operation just described has been performed is replaced by 100 c. c. of the water under examination, and 5 c. c. of the dilute acid. Permanganate solution is added in the cold, drop by drop, with constant agitation of the liquid by shaking until a momentary coloration remains. This point is reached when the oxidation of nitrites, etc., is completed, and the amount of permanganate solution required is noted. The water is next boiled for five minutes with an excess of permanganate solution allowed to flow in from the burette. The amount to be added depends upon the quality of the water, but enough must be added to make the liquid distinctly red after the operation of boiling. As soon as the boiling is completed the flask is removed from the sand bath, and 10 c. c. of the oxalic acid solution is added, which should cause the liquid to become colorless. The permanganate solution is now again allowed to flow into the flask, drop by drop, with constant agitation until the last drop produces a permanent coloration.

From the total number of cubic centimeters of permanganate solution thus consumed, the amount required for oxidation of nitrites, etc., as well as of the 10 cubic centimeters of oxalic solution, is deducted, the difference will represent the number of cubic centimeters of permanganate solution required to oxidize the organic matter in 100 cubic centimeters of the water.

The number of cubic centimeters thus found, multiplied by 31.62, and the product divided by the number of cubic centimeters required to oxidize 10 cubic centimeters of the oxalic acid solution, will give the parts of potassium permanganate required to oxidize the organic matter in 1,000,000 parts of water.

Where it is more desirable to state the results as organic matter, the absolute amount of the latter may be approximately determined by multiplying the parts of potassium permanganate by the constant factor of 5.

ANALYSIS OF FOSSILIFEROUS LIMESTONE.

An analysis was made of the fossiliferous limestone of the State quarries at Columbus, Ohio, for the purpose of determining its probable value as a phosphatic fertilizer.

The composition of this limestone was found to be, in one hundred parts, as follows:

Silicious matter	6.89
Calcium carbonate	70.00
Magnesium carbonate	5 55
Calcium phosphate	14.87

Ferric oxide and alumina	1.44
Organic matter (not determined)	
Total	98.75
Phosphoric acid (anhydride)	6.81

Assuming the phosphoric acid worth five cents per pound, the value of this limestone would be $6.81 per ton. When burned to lime it would be an excellent dressing for heavy clay land, where the lime itself would have a good effect upon the physical condition of the soil. It would be especially valuable on muck beds, where both the lime and magnesia would have a beneficial effect.

METHOD.

From a specimen of the limestone, weighing about twenty pounds, a section was taken and pulverized in an iron mortar. From this mixture enough was selected for the purpose of analysis, finely pulverized in an agate mortar and dried at 100 degrees Centigrade.

From this powder there were weighed off: 1 gram for phosphoric acid; 0.5 grams for lime, magnesia, etc.

The portion for phosphoric acid determination is transferred to an evaporating dish, treated with excess of nitric acid, and evaporated to dryness on a water bath. The residue is moistened with nitric acid, diluted with water and filtered. The filtrate, after concentration to a small volume, is treated with excess of a nitric acid solution of ammonium molybdate, gently heated and allowed to stand twenty-four hours. The precipitate of ammonium phosphomolybdate is filtered, washed with water containing ammonium molybdate solution, dissolved in dilute ammonia, and the phosphoric acid precipitated from the solution by an excess of magnesia mixture. After standing twenty-four hours, the precipitate of ammonium magnesium phosphate is filtered off, washed with water containing ammonia, dried, ignited, and weighed.

From the weight of magnesium pyrophosphate thus obtained, the percentage of calcium phosphate is calculated.

The other weighed portion is treated in a porcelain dish with excess of hydrochloric acid, evaporated to dryness on a water bath, residue moistened with hydrochloric acid, water added, filtered and washed. The filter is dried, ignited and weighed as silicious matter. The filtrate is rendered slightly alkaline with ammonia, after which acetic acid is added in slight excess, to re-dissolve the precipitated calcium phosphate. Ammonium acetate is then added, the mixture heated to boiling, and the precipitated ferric phosphate (with perhaps some aluminum phosphate) is filtered off, washed with hot water, ignited and weighed. The phosphoric acid being in excess, and the base being evidently nearly all iron, the precipitate was considered ferric phosphate, from the weight of which ferric oxide was calculated and estimated as ferric oxide and alumina.

To the filtrate above, ferric chloride was added until the solution was colored reddish. The mixture was then heated to boiling and the precipitate, which contained the remaining phosphoric acid, was filtered off, washed with hot water, and rejected.

The filtrate was rendered alkaline with ammonia, and the calcium precipitated from a hot solution with ammonium oxalate. After allowing to stand twenty-four hours the calcium oxalate was filtered off, converted into calcium carbonate and weighed. The weight thus obtained is reduced by the amount of calcium carbonate equivalent to the calcium phosphate already determined, and the remainder estimated as calcium carbonate.

The filtrate from the calcium oxalate is concentrated, if necessary, allowed to cool, rendered strongly alkaline with ammonia, and the magnesia precipitated with an excess of sodium hydrogen phosphate. After standing twenty-four hours the ammonium magnesium phosphate is filtered off, washed with water containing ammonia, dried, ignited and weighed. From the weight of magnesium pyrophosphate thus obtained the percentage of magnesium carbonate is calculated. The mount of organic matter present was not determined.

ANALYSIS OF MANURES.

Two specimens of manure were received from the State Board of Agriculture for analysis, one being solid and the other liquid. They were samples of manure employed in experiments which were embodied in a paper competing for the premium offered by the Board for the best essay on the "Value of manure." The urine of the animals was allowed to wash the faeces, and collected in a vessel placed under the floor.

The liquid portion contained:

Nitrogen	0.32 per cent.
Potash	1.47 "

The solid portion contained:

Nitrogen	0.44 per cent.
Potash	0.83 "
Phosphoric acid	0.58 "

Examination of fertilizer sent by O. T. Stauffer, Wadsworth, Ohio, through Hon. C. N. Lyman. In this sample only two ingredients were determined, namely, the total phosphoric acicd and nitrogen. The results were as follows:

Phosphoric acid	1.85 per cent.
Nitrogen	1.20 "

Examination of water sent by J. W. Etmier, Jacksontown, Ohio, January 26, 1885. The following statement accompanied the bottle: "Well dug last

fall in in dry time; vein of water reached at twenty-nine feet; we
four feet deep; sweet, sulphurous taste; after boiling reddish sedimen
bottom of vessel." A qualitative analysis revealed the presence of
carbonate, calcium carbonate, magnesium carbonate, and magnesium s
the magnesium salts being present in greatest quantities. The tast
dently due to the ferrous and magnesium salts.

EXHIBITED ANALYSES.

Exhibited analyses were prepared for the World's Fair at New O
the following substances: Potatoes, sugar beets, sorghum cane, four
of corn, Fultz wheat, rye, oats, barley, peas, and beans. The proxim
ciples in each case were shown in suitable bottles on the scale of one th
starting with one thousand grams of each substance.

THE RELATION OF CHEMISTRY TO AGRICULTURE.

The average American farmer has but a vague idea of the chemical changes which matter undergoes in order to produce his crops and to develop his stock. He has but a vague idea of the elements which combine to make up his wheat, corn, and hay, his potatoes and beets, his beef and pork, his milk, butter and cheese, and all the various products which he raises for the support of human life. His information is meager as to the indispensableness of certain of these elements to our cultivated plants as well as to the healthy and rapid development of our domestic animals. The sources from which these indispensable elements are derived, and whether these sources are inexhaustible or not are *vital* questions in agriculture, to which our average successful farmer pays little or no attention. The last remark contains an apparent contradiction. But still it was made advisedly and can readily be explained. Virgin soils contain all in an assimilable form, the elements of plant food necessary for the production of good large crops, although as each observing farmer knows, there is a wide difference in soils in this respect, some yielding renumerative crops for years, others for generations. In order then to be successful when operating upon soils of this nature, all that a farmer has to do is to apply the skill and industry, the care and judgment required by good farming. Nature attends to the rest.

In the comparatively short history of our country, and the still shorter history of our State, in the unbroken westward march of civilization from the shores of the Atlantic, disclosed to those who pressed forward State after State of fertile land that had never been wounded by the plowshare. American farmers, especially here in the West, have as yet not realized that condition of affairs which confronts the tillers of the soil in Europe, where no crop is expected without a liberal application of manure, and where the amount and quality of a peasant's barn-yard manure is a surer criterion of his thriftiness and wealth than the number of acres of land which he possesses.

In regard to the skill and industry of our American farmers, nothing need be said. They read their agricultural papers and are always ready to adopt the useful information which they contain. Hence we find new and improved labor saving machinery taking the place of the old; more attention given to rotation of crops and better methods of cultivation; better breeds of horses, cattle, sheep and swine rapidly supplanting the poorer ones, and a general improving and reclaiming of valuable land by ditching and tile-draining. All these important changes have been hastened by and are due to the beneficial influence exerted by the agricultural press, and it cannot be denied that they are essential to advancement in the farmer's art. If we could only keep on going West and conquering new lands indefinitely, or if nature would graciously supply those ingredients necessary to plant growth as fast as we remove them from the soil by the continued cropping, which has become necessary to support the life of our rapidly increasing population, then we might be contented with the knowledge we have and with the system of agriculture which we are pursuing. But geography and history teach us that we must not expect either.

Beyond the Rocky Mountains lies the Pacific Coast, and the most and best of the arable land between here and there is already taken up. In regard to the capacity of the soil for producing crops, I can do no better than to quote a few words from the writings of one of the most acute observers of modern times, the immortal Liebig, the father of agricultural chemistry. He says: "A visible gradual deterioration of the arable soils of most civilized countries cannot but command the serious attention of all men, who take an interest in the public welfare. It is of the utmost importance that we do not deceive ourselves, respecting the danger indicated by these signs as threatening the future of populations. An impending evil is not evaded by denying its existence or shutting our eyes to the signs of its approach. It is our duty to examine and appreciate the signs." When Liebig uttered these words, and when about forty-four years ago he published that first little book entitled "Chemistry in its Applications to Agriculture," which marks a new epoch in the history of this branch of human industry, the intelligent farmers of his own country were eager to listen to his teachings, and to profit by any light which the more accurate and rational methods of science might furnish. They had been educated in the school of experience, in which they learned that the greatest care, the closest attention, the most arduous labor, and an economy in the luxuries and necessaries of life so strict that among us it would be regarded as destitution, was demanded to extort from the soil enough to sustain themselves and families.

The experience of our farmers has been quite different, speaking of course in general terms. They have in most cases, with little or no start in life, been able by their own exertions to build up a pleasant home for their families, educate their children, and in the mean time to supply them lavishly not only with the necessaries but also with the luxuries of life. Fortified in his own mind with these speaking evidences of a successful career, the American farmer looks with a kind of pity, if not of disdain, upon the well meant efforts of science, to change or improve the system which he has been following. The nations of ancient times were excusable for the extravagant manner in which they squandered the bounties of nature stored up in their soil. They had no conception of the elements and compounds which built up the crops that they cultivated. They knew not the true relation that the soil bore to the plants which grew upon it. They were blind to the fact that the soil contained ingredients which were indispensable to vegetable growth, and that if only one of these indispensable ingredients was wanting, although the others were present in liberal quantities, vegetable growth would be an impossibility. They had no means of knowing that the capacity of soils for the production of crops was limited, and when after centuries of cultivation this limit was reached, and the soils failed to respond to the accustomed treatment, they could give no reasons for it, at least not the true reasons.

The early settlers of this county were also excusable for the system of soil robbery which they inaugurated. With fertile land all around them that could be had almost for the taking, it would have been sheer sentimentality in them to have hoarded up the treasures of the soil, and to have spent time and labor in saving and applying all kinds of fertilizing materials, when this same time and labor would obtain for them more than the equivalent amount of fertility in the form of new land.

But neither the excuse of the ancients nor that of the early settlers applies to the farmers of the present day. On the one hand science has pointed out general and infallible truths, which underlie the agricultural systems of the whole world, and it has opened our eyes to the laws which govern the transformations of matter as it passes from the mineral kingdom, from soil and air, through the vegetable into the animal kingdom, and after assuming here its most complicated forms breaking up again into the more simple inorganic compounds from which it originally came.

On the other hand, we may safely claim that there is scarcely a farm to-day west of the Mississippi river which would not respond gratefully to a more rational treatment, and which would not well repay the cost of carefully saving all the fertilizing waste material and returning it to the soil. The farmer who spends a life time upon a tract of land, tills it rationally, and leaves it in as good a condition as it was in when he took possession, has created something, has added to the world's wealth; but he whose ambition it is to make all he possibly can out of his soil, regardless of the fact that he leaves it in a worn out condition, has done but little more than to rob posterity of its rightful heritage.

It will be noticed that in these remarks the question of soil exhaustion has been very prominent. This was done for a very good reason. The rational treatment of the soil and the maintenance of its fertility is the pivot upon which the whole science of agricultural chemistry turns.

Chemistry has frequently been defined as the science which treats of the ultimate nature of matter, and the laws which govern its combinations and decompositions. If we contemplate the material objects which surround us on every side, we are naturally impressed with the infinite variety of forms which present themselves, and the mind become bewildered at the idea of grasping them all. For the chemist this endless variety of forms consists of a comparatively insignificant number of substances known as elementary bodies. The elementary bodies which unite to form a given object, express its ultimate composition or nature. The number of these elements which have thus far been discovered is only a little over sixty. Of these some are extremely rare, so that the number which we would be likely to meet in every day life is not more than thirty.

But again, the number of elements which occur in plants is still less, only fourteen. As animals subsist on plants it is evident that they contain the same elements. We will therefore only have to consider the plants. Four of these fourteen elements constitute the volatile portion of plants,—that portion which is consumed by fire—the other ten are found in the ashes. The volatile portion constitutes, on a general average, 95 per cent. of the weight of plants, and hence we observe that nearly the whole bulk of the vegetable kingdom is composed of but four elements, carbon, hydrogen, oxygen, and nitrogen. The first three, which constitute on a general average about 98½ per cent. of the total weight of the volatile part of plants, are supplied in unlimited and invariable quantities by nature.

The fourth element of this group, nitrogen, is continually supplied by nature in sufficient quantity to meet the wants of wild vegetation; but for the more intensive cropping demanded by civilization, this supply is inadequate, and hence, in order to insure an average and a constant production of crops from the same soil, this element demands the attention of the intelligent farmer, who strives to maintain the fertility of his soil for his own benefit and that of posterity.

If we consider, now, that 95 per cent. of the whole weight of our crops consists of this volatile portion, and that 98½ per cent. of this, as well as a part of the remaining 1½ per cent., is continually and graciously supplied by nature, it surely does not seem that the demand made upon our intelligence and exertions in this respect is very great.

We have now eliminated four of the fourteen elements with the favorable exposition just given. The remaining ten elements, potassium, sodium, calcium, magnesium, iron, manganese, sulphur, phosphorus, silicon, and chlorine, are found as already stated, in the ash of plants. Four of these, chlorine, silicon, manganese and sodium, do not seem to be essential to the development of our cultivated crops; but even if they were, they are present in our soils in such large quantities, compared to the amount which our crops remove, that there is no danger of ever getting in need of them.

Iron is absolutely essential to vegetable growth. In the total absence of this element no crop can be brought to maturity. But the amount required by our cultivated plants is so minute, while its supply in all varieties of soil is so plentiful, that in the question of fertilization the farmer may also ignore this element entirely. Calcium, magnesia and sulphur are indispensable ingredients of plant food. Their occurrence in the soil, however, is in general very abundant, and besides, they are constantly added as a necessary intermixture with other fertilizing material, and hence need no special consideration. The remaining two elements, potassium and phosphorus, are indispensable to vegetation, occur in the soil in comparatively small quantities, and at the same time constitute the bulk of those elements peculiar to the ash of our most important agricultural plants. Hence, these two elements demand the most careful attention in a rational system of agriculture, and if we add nitrogen to these we have them all.

From this hasty review of the elementary nature of vegetation we see that all of the simple substances yet discovered, which, in an endless variety of combinations form the infinite number of objects that surround us, and are recognized by our senses, we have singled out three—only three—that are intimately connected with soil exhaustion, and should be economized and returned to the soil in every available shape, and with all possible care and punctuality. These are no idle speculations, but facts pointed out by the unerring finger of science, and indelibly written on the pages of history. It is true, as already stated, that we have not yet reached the condition in which agriculture exists in Europe, but we are approaching it at a rate, perhaps, never before experienced in the history of a people.

The unparalleled progress in the facilities of transportation made since the signing of the Declaration of Independence, has brought the civilized nations of the whole world into the closest relationship. We needed, as a new country, many of the articles manufactured in the old. Our chief articles of export were raw agricultural products, which were eagerly sought across the water. This practice is still kept up. One article of importation alone, namely sugar, takes from us a hundred million of dollars annually, and we exchange for it the fertility of our soil. Coupled with this has been the most reckless wasting of fertilizing materials by farmer and manufacturer alike.

It would be pleading for a lost cause if the only incentive for improvement in our practices were to be found in the thought that we are doing our duty to posterity, but there seems to be no cause for discouragement when from what has already been said we can see that weighty and most convincing argument, the almighty dollar.

In view of all these things may we not ask ourselves the question, whether the time has not come to change the apathy which exists in our agricultural circles toward the teachings and admonition of science, into an earnest desire to appreciate the reasons for, and the means of securing a more rational treatment of our soils.

It is surely not asking too much of intelligent farmers to study and learn the relation which those three simple substances already spoken of—potassium, phosphorus and nitrogen—bear to the soil, to the crops, to the stock, as well as to other minor products, and the waste materials which constantly appear in ordinary farm management. Many of the practices in general use at the present time are in accordance with the teaching of science. Many correct methods which are employed to-day in farm management were also in use long before science shed any light upon the subject, and explained the true reasons for these methods. Many such cases occur in other departments of the arts and industries where empiricism has been found to be in advance of science. This makes the matter all the more easy. There is nothing left to do but to seek that information which would enable the farmer to make an intelligent use of the means at his command.

Right in this connection it might be appropriate to remark that it is not the province of agricultural chemistry to formulate fixed rules or precepts to meet the exigencies of all the possible combinations of circumstances and conditions that may present themselves upon each man's farm throughout the land, and to make out of each farmer a mere mechanical tool to carry out these rules and precepts according to given instructions.

Agricultural chemistry has a grander and nobler object to achieve. It is to point out and teach those principles and infallible truths of the science of chemistry which are inseparably connected with agricultural pursuits; it is to educate our agricultural population up to an appreciation and understanding of these vital principles to secure their general dissemination, and thus to elevate our system of agriculture from the slough of empiricism which now surrounds it in this respect, and to place it upon a broad, sound, scientific basis.

We have several times employed the expression, "rational system of agriculture." It is in a few short words the embodiment of those methods which tend to produce the largest amount of agricultural products from a given tract of land, and at the same time to maintain the capacity of the soil up to this standard. Agricultural pursuits are so varied in their nature that there exist more or less points of contact between them and all the sciences, but it would be manifestly out of place at this time to make comparisons. All of them lend invaluable aid in establishing a rational system of agriculture.

From the definition given of chemistry it will be remembered that the science treats especially of the elementary or most simple forms of matter, and of the laws by which these elementary forms of matter unite to produce complex ones. The province of agriculture is to build up from these simple elements, whether they exist in the soil or air, complex substances for the support of human life. At any stage of development these complex substances—plants and animals—at any point in the continuous circuit which matter thus describes, the chemist can recognize and recover, and can determine the proportion and quantity of the elementary bodies which have formed them.

From these considerations, in connection with those before given, it is evident that the assistance which chemistry can lend in making agriculture what it should be is both vital and varied. To give an illustration of the wide application which may be made of the principles of chemistry to agriculture, it may be stated that at the University of Halle, in Germany, no less than five full professorships are devoted to this subject alone. One of these professors lectures a whole year on nothing but milk.

From the statement made above, of the ability of the Chemist to determine the elementary constituents of the soil and air, as well as that of the plant and animal at any stage of their development, it might readily be inferred that the farmer could easily get the information which would enable him to raise a certain crop on a given piece of land in abundance and without fail. All that he would have to do, would be to take a specimen of his soil to a chemist, have it analyzed, and then let the chemist tell him what to add to his soil in order to produce the desired crop. This was for a while the opinion of scientists, after the publication of Liebig's book, already referred to.

This view was greatly strengthened by the experiments of Wiegman and Polstorf two years later. These two observers, at the initiative of the University of Gottingen, furnished the first experimental proof of the indispensableness of the ash ingredients to vegetable growth. The immediate followers of Liebig were enthusiastic over the apparent achievement of chemical science to afford instant relief to the depressed condition of agriculture in the Old World. They were all the more encouraged in this hope, as about the same time numerous important industries had sprung up, in which chemistry was the guiding star.

But in the new application of the science to agriculture, difficulties were soon encountered which, in other cases, had never been met before. Here chemistry was brought face to face with the vital forces of the vegetable and animal kingdoms; forces which cannot be measured nor imitated by the methods and appliances known to science.

The soil consists of an extremely heterogeneous mixture of substances, in varying degrees of fineness and solubility. About nine-tenths of it consists of sand, clay and gravel. This portion takes no part in vegetable nutrition, but merely serves the purpose of supporting the plants and of holding the plant food. The remaining one-tenth contains the ten elements spoken of as occurring in the ash of plants, as well as the only element of the volatile portion of plants, which demands our attention, namely, Nitrogen. All of the food of plants is contained in the latter one-tenth of the soil.

But, again, this nutritive portion of the soil is composed, on the one hand, of what is known to the chemist as simple salts and oxides, namely, nitrates, phosphates, sulphates, silicates and chlorides of ammonium, potassium, sodium, calcium and magnesium, and oxides of iron and manganese; and on the other hand of undecomposed particles of original felspar rocks and humus. The former group constitutes the assimilable portion of plant food, the latter the reserve. Plants have the power of choosing between the assimilable and reserve portion, and the immediate fertility of the soil depends upon the former. The chemist, however, has not yet succeeded in imitating the plants in this respect, although an immense amount of time and labor has been spent in endeavoring to secure a solution of this problem. This stumbling block entailed upon those who were engaged in making original investigations in the new field of research, an unexpected amount of additional labor

The relation of the ash ingredients to each other and to the plant had to be studied in detail, and in all of the investigations made the plants themselves were necessarily brought into requisition. If we bear in mind that plants must have their own time for development, and that the untried artificial media which had to replace the natural soil in these investigations, did not always fulfill all the conditions necessary to vegetable growth, although the plant food was contained in them in abundance and in an assimilable form. We can readily understand that the labors in this direction required an unusual amount of time, care and patience, as compared to ordinary chemical investigations. But, thanks to the material aid rendered by the governments of the Old World, and to the proverbial endurance and thoroughness of the German investigators, one by one of the elementary constituents of our cultivated plants have either been placed into the category of essential and indispensable elements of plant food, or into that of the merely accidental.

If we follow the continuous circuit of matter as it passes from the mineral kingdom up through the animal and back again to the mineral, we will find another point directly opposite to the one which we have just considered, and exactly analagous to it, in that the methods of chemistry as at present employed, and taken by themselves, are unable to give definite and satisfactory answers to the questions involved. This point is reached where the plants are fulfill-ing the object for which they were created—in the nutrition of animals. With the data at hand the problem seems just as simple, just as easy of solution, as that of the nutrition of plants seemed at first view. The exact composition of ever part of our domestic animals is known to the chemist. The proportion of these parts among themselves in forming the whole body of the animal is also known. Now as every element in the animal body must come directly or indirectly from vegetation, it would appear that an ultimate analysis of a plant or part of a plant would determine its nutritive value. But here again we find by experience that the digestive functions of the animal do not seize upon the nutritive elements as a whole. Some of the combinations are completly digestable, others are only partially digestable. How much of the latter are digestable, a simple analysis of the plant or part of a plant will not determine. But there is a way out of difficulty here again. As before, the plant was required to make the test of the fertility of the soil and to point out what might be wanting, so here the animal functions are called upon to decide as to the nutritive value of any given feeding stuff. It is needless to say, however, that no intelligble results could be obtained in either case without the aid of chamical analysis. The amount of time and labor already expended in the examination of products, which on the one hand might serve as food for plants, and on the other as food for animals is very great taken in the aggregate, and the results and data obtained are sufficient to warrant an intelligent use of the means at hands.

THE SUGAR INDUSTRY.

There seems to be no time more opportune for the consideration of the possibilities of the sugar industry in our own country than the present. The production of a home demand for sugar made on our own soil, and by our own labor, is a question of more than passing interest to American agriculture at the present time. Nine-tenths of the sugar consumed in this country by its fifty millions of inhabitants comes from abroad. Our chief exports to meet the balance of trade are raw agricultural products.

Sugar is composed of carbon, hydrogen, and oxygen—elements which come from the air. Our exports contain, besides these, the elements of fertility of our soils. In other words, we are exchanging the fertility of our soils for an article which brings nothing to our soil in return. We are following the example set by the nations of the Old World, who have risen to greatness, flourished, and then passed away. We are exactly imitating them in our system of agriculture, only on a grander and more rapid scale, owing to our increased facilities of transportation. Our forefathers were excusable for instituting the system of squandering the bounties of nature stored up in our soils. They had a continent of unexplored fertile land stretched out before them, and to subjugate this territory to the plow-share, to clear off the dense forests wherever they existed, and to introduce as rapidly as possible the requirements of modern civilization was the task allotted to them. We are now, from one end of this broad land to the other, reaping the benefits of their arduous labors and deprivations, while we are making but poor provisions for the generations which are to follow us.

The excuse for the actions of the early settlers of our country in this respect exists no longer. Our arable land is nearly all taken up. Our population is rapidly increasing in accordance with the inexorable law, that other things being equal, the number of inhabitants of a country is directly proportional to the fertility of the soil. This increase in population is beyond the control of civilized people and their governments, and is limited only by the capacity of the soil to furnish sustenance.

If, after this limit is reached, the fertility of the soil should remain constant, there would be no reason, so far as this factor is concerned, why the happiness and prosperity of a nation once established should not be permanent. But the history of bygone peoples teaches us that this is not the case. Desert wastes in many countries occupy the regions which in ancient times were teeming with inhabitants and dotted all over with populous and flourishing towns and cities. In modern times similar disasters have been prevented by the discovery of new worlds, whose surplus of food production has in a great measure supplied the wants of older countries. History will repeat itself on our fertile plains if a more rational system of farming does not take the place of our present wasteful practices, and it would be a sad picture to contemplate, when the soil should cease to furnish the food necessary to sustain the hundreds of millions of inhabitants which its present fertility is destined to create, and no second America left to supply their wants.

After these considerations it would seem that every agricultural industry, which tends to counteract the deterioration of our soil, should receive the hearty support of all persons interested in our national welfare.

Referring now to what was said above of our importation of sugar and exportation of raw agricultural products, we are surely justified in claiming that this condition of affairs is utterly indefensible from the standpoint of agricultural science.

In order that the sugar industry should be of the greatest benefit to our agriculture, it ought to be as widely disseminated throughout our territory as possible, and to this end our wide range of climate is peculiarily adapted. The Gulf states are able to produce southern Ribbon cane, the northern tier of states are adapted to the cultivation of sugar beets and the intermediate territory by far the largest and most important part of our domain, can raise Sorghum or Northern cane, which through the experiments made in the last few years, has unquestionably been ranked among the sugar producing plants.

It would be useless to consider here the adaptability of the first two mentioned plants to the production of sugar. Southern cane in its native climate always was a sugar producing plant, and the sugar beet industry through the fostering care bestowed upon it by the governments of the Old World, and aided by the investigations of the highest authorities in chemical science, has reach such a magnitude in the last few years as to make it a formidable competitor even to the sugar industry of the southern islands. Not so with the sorghum sugar industry. Although the development of the results in the experiments with sorghum made at Champaign, Ill., in which the writer was engaged, attracted the attention of the agricultural press and were watched with interest by individuals from all portions of the country; yet the facts by which its success in the manufacture of marketable sugar and syrup has been demonstrated, have not received that general dissemination which the importance of the subject merits.

The main results of these investigations are as follows:

1. The varieties of cane best adaptad to the production of sugar are: Early Amber, Liberian, Early Orange, and Link's Hybrid. Seed should be planted as early as possible, so as to get a good start before there is any danger of a drouth, and in order that the plants may be brought to maturity during the long days of summer. It is sunshine that makes the sugar.

2. In the ordinary seasons as they exist in the great corn belt of this country, the maximum quantity of cane sugar or crystallizable sugar in the plant is reached, when the seed is in the hard dough stage. If cane is allowed to stand in the field after this stage is reached, the quantity of cane sugar gradually diminishes.

3. After the cane is cut a gradual conversion of the crystallizable sugar into invert or uncrystallizable sugar takes place, and in course of time not a trace of cane sugar remains in the plant. Hence the cane should not be cut more than a day in advance of crushing.

4. Stripping the cane, especially if a portion of it has not matured, and allowing it to stand in this condition has a most deleterious effect upon the content of cane sugar. The sugar present in the stalk at the time of stripping especially if the plant is immature is consumed by other functions, as production of seed, while its formation entirely ceases.

5. Removing the heads soon after they make their appearance, and before the formation of the seed takes place, increases the amount of cane sugar in the juice by at least 3 per cent. This interesting result was anticipated by theoretical considerations of the nature of the plant, and the truth of the theory was fully sustained by numerous experiments in different seasons and with several varieties of sorghum.

6. The analyses of cane grown upon different soils showed no greater discrepencies in the amount of cane sugar than might be due to location and methods of cultivation. On sandy soil the coefficient of purity was greatest.

7. Fresh barn-yard manure has a deleterious effect. A liberal application of it increases the amount of foreign matters in juice to such an extent as to render the defecation of the juice extremely difficult, if not impossible. Phosphates have a beneficinl effect, not only in hastening the maturity of the plant, but also in increasing the amount of cane sugar.

8. Sorghum juice in its normal condition contains varying quantities of free vegetable acids. On the application of heat to the juice in its natural state an inversion of the cane sugar takes place in proportion to the amount of free acid and the time of heating. Hence, the first step in the treatment of the juice is to neutralize the free acid. Milk of lime is the best neutralizing agent. After defecation and concentration the semi-syrup still contains a portion of the albuminoids, as well as gummy matter, soluble starch and mineral salts. These interfere with the crystallization and subsequent purging of the

sugar, and hence must be removed. This is best accomplished by means of bone black. The filtration through bone black has also the effect of removing the odor and taste of "Sorghum." With the precautions here suggested, the manufacture of sugar from sorghum presents no difficulties whatever. The granulation of the sugar takes place in the vacuum pan with perfect regularity.

In the season of 1882 the amount of sugar manufactured at Champaign, Ill., was 86,000 pounds from 185 acres of cane, averaging 465½ pounds per acre. A field of 12½ acres of the best cane yielded 9,600 pounds of sugar, or an average of 768 pounds per acre. The quality of the sugar was Yellow C, and sold at the factory at 8 to 8½ cents a pound, by the barrel. The season of 1882 was noted, at least in Illinois, for its excessive rainfall and unusually low temperature. For these reasons the percentage of sugar in the juice was extremely low, as compared with ordinary years.

In 1883 the Champaign Sugar Company planted 600 acres of sorghum; the Syrup Works at Hoopestan, Ill., planted about 800 acres and remodeled their works for the manufacture of sugar; and a new company was organized, chiefly of citizens of Champaign, with works at Sterling, Kansas. The prospects for a cane crop were good, although the season was rather late, when, on the 9th of September, a disastrous frost throughout the north-west almost ruined the cane, as well as the corn crop, in Illinois.

The Kansas Company were disappointed in not getting their machinery in time, as well as by the faulty construction of their crusher, so that only a portion of their crop could be manufactured into sugar. The seasons yield of sugar at these factories was as follows:

Sterling, Kansas	202,000	pounds.
Champaign, Illinois	160,000	"
Hoopeston, Illinois	90,000	"

All of this sugar was of excellent quality, and sold side by side with New Orleans sugar, bringing the same prices.

In the season of 1884, the yield of sugar at the factories mentioned below was as follows:

Hutchinson, Kansas	250,000	pounds.
Sterling, Kansas	200,000	"
Champaign, Illinois	150,000	"

Our ability to manufacture sugar over a wide extent of territory on a commercial scale has been fully demonstrated, and it is only to be hoped this promising industry may receive that public aid for its development, which the great agricultural interests of the country demand.

TREASURER'S REPORT.

EMMETT MIX, IN ACCOUNT WITH THE OHIO AGRICULTURAL EXPERIMENT STATION.

Receipts.

Balance on hand March 10, 1884	$1,896 48	
Appropriation for 1884	5,000 00	
		$6,896 48

Disbursements.

Salaries	$1,770 00	
Labor	1,908 44	
Equipment, implements and apparatus	900 94	
Postage, printing and stationary	456 85	
Express and freight charges	66 84	
Expenses of Board of Control	55 00	
Cash balance on hand	1,738 41	
		$6,896 48

Memorandum.

This statement covers the expenditures from March 10, 1884, to March 7, 1885, inclusive. The Station has no outstanding liabilities. The estimated expenses up to May 1st, the end of the fiscal year, are: Current expenses, $1,200; for distribution of annual report, $300.00; for apparatus and equipment, $200.00. This leaves a balance of $38.41.

Emmett Mix,
Treasurer.

N. Ohmer,
W. N. Cowden,
Auditing Committee.

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Acknowledge the Receipt of this, if you wish subsequent Reports.

FOURTH ANNUAL REPORT

OF THE

OHIO AGRICULTURAL EXPERIMENT STATION,

FOR

1885.

PRINTED BY ORDER OF THE STATE LEGISLATURE.

COLUMBUS:
MYERS BROTHERS, STATE PRINTERS.
1886.

OHIO STATE UNIVERSITY,
COLUMBUS, O., *March* 1, 1886.

To Governor J. B. Foraker:

SIR: I have the honor to submit herewith the annual report of the Ohio Agricultural Experiment Station, for the year 1885.

I trust it will meet the approval of your Excellency and the General Assembly, and prove satisfactory to those engaged in Agriculture and Horticulture, for whose benefit the Station was established.

Very respectfully,
WILLIAM R. LAZENBY, *Director.*

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BOARD OF CONTROL AND OFFICERS OF THE OHIO AGRICULTURAL EXPERIMENT STATION, 1885.

STATE BOARD OF CONTROL:

His Exc. Gov. J. B. Foraker	*Ex-Officio.*
William R. Lazenby	*Director.*
Emmett Mix, Avenue	*President.*
W. N. Cowden, Quaker City	*Secretary.*
J. C. Stevens, Kenton	*Treasurer.*

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WILLIAM R. LAZENBY.

Chemist:

H. A. WEBER.

Superintendent of Field Experiments:

W. B. ALWOOD.

Botanist:

W. S. DEVOL.

Horticulturist:

W. J. GREEN.

GENERAL ANNOUNCEMENT.

The Ohio Agricultural Experiment Station was established in accordance with an act of the General Assembly, approved April 17, 1882, "for the benefit of the interests of Practical and Scientific Agriculture, and for the development of the vast agricultural resources of the State."

The experiments and investigations are carried on both in the field and laboratory, and deal with the following great agricultural interests, viz.: (1.) Grain Raising. (2.) Stock Farming and Dairy Husbandry. (3.) Fruit and Vegetable Culture. (4.) Forestry.

The Station is prepared to test varieties; to analyze and test fertilizers and manures, soils, waters, milks, cattle-foods, etc.; to examine seeds that are suspected of being unsound or adulterated; to identify and name weeds and other plants; to investigate and describe, when known, the habits of injurious and beneficial insects, and other work of a similar character that properly comes within its province.

It is the desire of the Board of Control to make the Station as widely useful as its limited appropriation will permit. To this end we earnestly invite the co-operation of the people and press of the State.

All communications on agricultural and horticultural topics will be fairly considered, and, as far as possible, promptly answered. Detailed reports of experiments, carefully and conscientiously made, will aid the Station in its work. Any citizen of Ohio, who is concerned in the promotion of agriculture, has the right to apply to the Station for any information it can render, and the Station will cheerfully respond to all applications, as far as lies in its power.

Samples of different varieties of corn, wheat, oats, barley, and other grains; the seeds of fruit and forest trees; vegetables and flowers, that are true to name; specimens of grasses, weeds, and other plants that may be of interest; sections of different varieties of wood; specimens of injurious and beneficial insects; these, and other articles and materials illustrative of any department of agriculture, will be gladly received.

Address all communications to

William R. Lazenby, Columbus, Ohio.

EXPERIMENT GROUNDS AND OFFICES

AT THE

OHIO STATE UNIVERSITY, COLUMBUS, O.

REPORT OF THE BOARD OF CONTROL.

To the General Assembly of the State of Ohio:

GENTLEMEN: We submit to your honorable body the Fourth Annual Report of the Director and other officers of the Ohio Agricultural Experiment Station for the year ending March 1, 1886.

The work carried on the past year has been a continuation of the investigations begun when the Station was organized, together with such additional experiments as means and opportunity have rendered possible. We are happy to state that the past year has been one of substantial progress.

Letters from all portions of the country cordially commend the work that is being done, and we feel justified in renewing the assertion of last year, that for the money expended no public institution is doing more for the welfare of the citizens of our State

The contents of this and former reports bespeak the degree of success that has attended our efforts.

It is confidently expected that the Experiment Station will have a still wider scope in the future than it has had in the past. Thus far its work has been in a great measure directed to a comparatively few staple crops.

Henceforth it will seek to embrace the great agricultural interests of the State more in detail, giving prominence, as heretofore to staple products. while devoting as much attention as possible to stock-feeding, breeding and dairy husbandry, not neglecting the meadow, orchard and forest; in short, to study and report upon all subjects about which the farmer most needs to know. It is designed to increase the working force of the Station by the appointment of a Veterinarian, an Entomologist, and a Superintendent of Experiments in Forestry.

Thus officered and equipped, the Station looks hopefully to new achievements, and wider fields of usefulness.

EMMETT MIX,
President of Board of Control.

W. N. COWDEN,
Secretary of Board of Control.

FOURTH ANNUAL REPORT.

INTRODUCTION.

The object of the Ohio Agricultural Experiment Station, together with the nature and scope of its work have been sufficiently explained in previous reports.

This work has gone on without interruption the past year, and is herewith presented in detail.

The primary object of the Station is to suggest improvement in farm and garden management. It seeks to apply scientific principles to practical agriculture and horticulture. Its aim is to show how the products of the farm may be increased, and the cost of production diminished.

Experiments that lead to reliable conclusions require skill, time and money. The Station has faithfully devoted whatever of these requisites it had at command to the object for which it was established.

SUMMARY OF YEAR'S WORK.

As heretofore, field experiments with grain, fruit and vegetables have claimed a large share of the Station's attention.

In addition to this some feeding experiments have been undertaken, and numerous special investigations have been made.

In connection with this work the climatic conditions have been regularly noted; numerous chemical analyses have been made; observations have been instituted to study the effect of special commercial fertilizers; the best methods of meeting certain insect enemies and checking plant diseases; experiments in cross fertiliztion have been repeated and the study of weedy plants continued.

CORRESPONDENCE.

This has been extensive and varied. Over twenty five hundred letters have been answered by the Station officers during the past year. They were mainly of inquiry and came from all parts of the United States and Canada. Many of these letters asked for information concerning varieties of grain, grass, fruit, vegetables, noxious weeds and injurious insects. Others inquired about the management of stock, the preservation and use of farm yard manure, the application of commercial fertilizers, methods of cultivation, and many other subjects pertaining to agricultural practice. All communications of this character have been fairly considered, and with few exceptions promptly answered.

TESTING THE PURITY AND VITALITY OF SEEDS.

This continues to be a very useful feature of the work of the Station, and the oft-repeated assurances of losses averted by means of tests made, are sufficient proof of its importance.

Good crops cannot be raised from poor seed, no matter how favorable all other conditions of success may be.

The saving to the State by the improved methods of selecting and preserving seed-corn alone, is worth many times the whole cost of the Station since its establishment. Special attention is called to this portion of the report.

NAMING PLANTS AND INSECTS.

A larger number of specimens of weeds, grasses and other plants, grain, fruit and insects have been sent to the Station for name and history during the past year than ever before. These specimens, almost without exception, have been indentified and fully described. Special pains is taken to give all the information possible regarding the history, habits and remedies for weeds and insect pests.

DETECTING BOGUS BUTTER.

Few subjects are attracting more attention at the present time than the adulteration and counterfeiting of butter. Some recent experiments made by the Department of Agriculture at Washington, appear to give conclusive evidence that by the aid of the microscope genuine butter could be readily distinguished from butter substitutes. An elaborate investigation of this subject by the chemist of the Station has led to a different conclusion.

The report on this subject is of great interest, and will repay careful study.

FORESTRY.

A State Forestry Commission having been appointed by the last Legislature, with a special appropriation for carrying on its work, the Station has done but little the past year in extending its experiments in forest-tree culture. Something has been done, however, and earnest attention is called to this portion of the Report. There are few subjects connected with the welfare of the State that demand more serious attention.

The Station is endeavoring to show how our best timber trees can be cheaply and successfully grown from seed; which are the best varieties for different soils and exposures; the best methods of transplanting and trimming; the best time to cut, and the most effective way of preserving timber.

To do this wisely is to render the State a service of signal value.

STATION PUBLICATIONS.

During the past year brief bulletins, circulars and notes have, from time to time, been published. These have been extensively copied by the agricultural press, and have received many words of commendation. As no provision is made by the act establishing the Station for any publication except for the annual report, with the means at command little can be done in the way of issuing frequent bulletins. A slight increase in the appropriation would provide for the prompt dissemination of the results of the Station's work.

Arrangements are now being perfected by means of which the leading agricultural journals and other newspapers of the State will serve as efficient means of communication between the Station and those for whose benefit it was created.

ACKNOWLEDGMENTS.

During the past year the Station has received many valuable donations, for which it returns heartfelt thanks. These gifts not only add to the efficiency of its work, but show that its labors are cordially approved.

The kind words with which the last report was received have greatly encouraged the Board of Control and officers. Working without any adequate compensation, the assurance that their efforts in behalf of the agricultural interests of the State are appreciated by those best fitted to judge, is a welcome reward. Friendly counsel and cordial co-operation cannot fail to inspire new zeal in all connected with the direct management of the Station.

It is the earnest purpose of those into whose hands the direction has been given, to keep the Station up to the high ideal with which it started.

The Station cannot be regarded as the exclusive property of any special class. It has a wide scope, and aims to benefit all who will mingle thought with work. Through its teaching, practice may obtain the benefit which science can confer, and science may be guided into broader fields of usefulness under the suggestive needs that only practice can point out.

WILLIAM R. LAZENBY,
Director.

REPORT OF SUPERINTENDENT OF FIELD EXPERIMENTS.

EXPERIMENTS IN WHEAT CULTURE.

The experiment plots of wheat were almost a total failure the past year from the unprecedented severity of the winter.

The general appearance of the work was never better than during the fall of 1884, but, unfortunately, the field lay bare of snow, and in an exposed situation, so that wind and frost had a fair chance to do their worst. The plants were not heaved or broken, and this led us to hope that many would revive with the spring rains, but in this we were disappointed, except in a few instances as hereafter noted.

As early as practicable one-half of each plot was harrowed and rolled, but without any effect. From a large majority of the plants new roots started, but the vitality was so much exhausted, and the spring weather being unfavorable, there was no growth above ground, and they were soon entirely dead. Several examinations of the ground in early spring, showed that the frost had penetrated two and one-half to three feet deep.

The wheat fields of the University Farm Department were only a short distance from the experiment field, situated on the Olentangy bottom, except one field which extended a short distance on the upland. The crop on these fields was quite good, not up to the average produced here, but much better than the average of the State. In the spring the plants on these fields appeared to be frozen nearly or quite as bad as on the experiment plots, but they very soon showed signs of vitality, and produced yields as hereafter given. The difference in elevation between the upland and lowland is 30 to 50 feet. The soil of the upland is a brownish gray clay loam. The bottom land is a black loam and alluvial deposit, which scarcely ever suffers from lack of moisture. The soil of the experiment field is quite apt to suffer from this cause.

The bottom fields had some slight protection from a fringe of forest trees along the river. The yields from the fields of the farm were as follows:

Velvet Chaff, field No. 1	8 acres;	15.7 bushels per acre.
" " 2	14 "	19.1 " "
" " 3	5 "	21.4 " "
Martin's Amber	1½ "	24.0 " "
Valley	4½ "	15.1 " "
Finley	4½ "	32.2 " "

It did not occur to us in the early spring to examine the bottom fields to see how deep they were frozen. We do not offer any one special reason for the different results of these fields situated so nearly together, but have set forth the points of difference in the conditions of each. In some localities upland wheat survived and lowland wheat was destroyed, and *vice versa*. It is probable that the amount of moisture, and the exposure to and severity of the winds are important factors in the question.

Of the Station's variety experiments in large plots, but one produced any appreciable crop. This was Russian May; a variety not noticeable for any especially good qualities. It somewhat resembles Finley. It had about 15 per cent. of a stand and yielded 11 pounds of wheat from $\frac{1}{33}$ of an acre. The straw was too weedy to be weighed. This plot was in the most exposed part of the field. Two other plots near the fence, and at times protected by snow, produced a few bundles of wheat. Of this small yield no notice was taken.

Velvet Chaff in the same series of plots, was entirely destroyed, yet produced a partial crop in other parts of the field, as will appear further on.

The varieties sown in small plots which made any stand at all are here noted:

Alabama, just a few stalks.
Big Frame, about 40 per cent.
Blue Stem, about 30 per cent.
Canada Club, just a few stalks.
Golden Drop, about 5 per cent.
Hicks, few stalks.
Hungarian White Chaff, few stalks.
Menonite, about 40 per cent.
Red Chaff, about 5 per cent.
Red May, about 8 per cent.
Rice, few stalks.
Rickenbrod, few stalks.
Russian May, about 50 per cent.
Siberian, about 80 per cent.
Small Frame, 40 per cent.
Yellow Missouri, about 30 per cent.
Zimmerman, about 90 per cent.

The ordinary plot of Zimmerman was entirely destroyed, while the plot resulting from the best selections of two previous years produced nearly full crop.

All other selections aside from this were entirely lost, so also were the plants from crosses made the previous season.

Aside from Zimmerman just mentioned, the most noticeable stand was Siberian. This is a late not especially promising wheat, but made a remarkable record when almost everything was destroyed around it. We were able to re-sow nearly all our former list of varieties this fall and added to it a large number of new ones. The special work with varieties will be further noticed after a brief discussion of the field plots.

None of the plots of fertilizer-work were cut separately, the best stand being only about two per cent. of a crop. It was particularly noticeable that where fresh horse manure was used not a stalk appeared. Where composted manures were used there was in each instance a slight stand. The animal manures were all applied as a top dressing, at the rate of 16 tons per acre. This practically amounted to a light mulch. Of the special manures, occasionally one plot appeared to show some slight advantage over another, but this was not sufficiently marked to admit of any conclusions to be drawn. Incidental differences of soil, drainage, etc., must always be considered as elements of variableness in field experiments.

In the case of the plot treated with horse manure, above mentioned, the destruction was so complete as to leave little doubt about the manure helping to produce the result. This plot was one of the most rank in fall growth, and those who read the Station report for 1884 will remember that the plot treated with fresh horse manure produced the maximum yield of wheat. No doubt the vigorous fall growth made the plants of this plot more tender than those of others.

THICK AND THIN SEEDING.

The work in thick and thin seeding made sufficient stand to warrant the harvesting of the plots separately. The per cent. of stand seems to have been greater or less according as there was a greater or less amount of seed used. The crop was very slight on the thinnest sown plots, but all were cut and threshed that the record might be as complete as possible. The yields were as follows from $\frac{1}{16}$-acre plots:

	Seed per acre.	Weight of grain from plot.	Yield per acre.	
		Lbs.	*Bus.*	*Lbs.*
1	Two pecks	4	1	4
2	Three pecks	6¾	1	48
3	Four pecks	12½	3	20
4	Five pecks	12	3	12
5	Six pecks	17¾	4	44
6	Seven pecks	19	5	4
7	Eight pecks	23¼	6	12
8	Nine pecks	28¼	7	32

One comparison will show that the rate of increase in yield was greater than the rate of increase in seed.

The increase in seed used on plots one to eight was 450 per cent., and the increase of yield is 606 per cent.

The straw of these plots was not weighed on account of being very weedy.

From previous tests we should unhesitatingly say that four pecks of seed is a sufficient quantity per acre, if the soil is in proper condition and there are no exceptional climatic conditions; the inference is quite plain from the foregoing table that the increased amount of plants per acre acted as a protection and enabled a greater per cent. of the plants to survive.

This, however, is no conclusive argument in favor of thick seeding, as in the case above, nine pecks per acre failed to produce more than one-fourth of a crop. To attempt to overcome exceptional climatic conditions by heavy seeding would not be advisable.

Perhaps the only occasion where thick seeding can be recommended is where a farmer so poorly prepares his soil that part of the seed will not have an opportunity to grow, or where poor seed is used.

None of the plots in methods of culture or early and late seeding were harvested. Of the latter, plots sown as late as October 6 stood as well as those sown earlier. Velvet Chaff variety was used throughout all the general work.

SPECIAL STUDY OF VARIETIES.

The Station has not heretofore discussed the origin of wheat or the history of its many varieties, considering it more curious than practical. Much has been done, however, in the way of collecting as many varieties as possible and cultivating them under similar conditions for comparison and study. This we think is of importance and may result in much good. There is no doubt that many of the variety names are local names for the same wheat, or that many of the varieties have come into existence through the local influence of climate and culture, changing the characteristics as to color, etc. The vast number of varieties which could now be collected from different sources in this country form a babel-like confusion of names out of which one must be well informed to select those few that are most desirable.

Looking at the matter in this light, we have attempted to compare and classify the different varieties which we have grown, with a view of simplifying their nomenclature or at least furnishing lists of approximate synonyms, so that the farmer and seedsman would be able, in a measure, to group those varieties together which are quite similar. We disclaim any intention of setting up a botanical classification which can be recognized by all, for, in fact, the characteristics upon which the grouping rests are so subject to change by selection and climatic influence that even broad groups would need to be frequently revised. Perhaps there may be many varieties cultivated in different parts of the country under names found in our list which would not answer to the description we give them. This only argues the more need that some attempt at classification should be made. Unfortunately, we were not able to carry this study forward as we had hoped this year, on account of losing the trial plots, but the varieties have been resown and the list largely increased.

The two general divisions of wheat into Bearded and Smooth varieties are recognized by all. The grouping here given is based upon color of glumes and berry, and condition of head as to being bearded or smooth. Those which most closely resemble each other in general appearance come at the head of each list and are marked with the asterisk (*). In several cases these are then followed by other names which bear resemblances in color and other points.

FIRST GROUP.

Characteristics.—Glumes awned or bearded, bronze colored, red kernel; head and kernel usually medium or large size.

1. *Australian.
2. *Boyer.
3. *Buckeye.
4. *California Blue Stem.
5. *Cornell No. 4.
6. *Datt Red.
7. *Lancaster.
8. *Mediterranean.
9. *Red Amber.
10. *Red Saa.
11. *Red Russian.
12. *Scott's Bearded.
13. *Swamp.
14. *Tasmanian Red.
15. *Tuscan Amber.

SECOND GROUP.

Characteristics.—Glumes awnless or smooth, bronze colored, red kernel; head and kernel usually medium or large size.

1. *German Amber.
2. *Mammoth Red.
3. *McGhee's Red.
4. *Michigan Amber.
5. *Pool.
6. *Red Fultz.
7. *Siberian.
8. *Shumaker.
9. *Southern Amber.
10. Winter Pearl.

THIRD GROUP.

Characteristics.—Glumes awnless and bronze colored, white kernel; head and kernel usually large.

1. *Clawson.
2. *Cornell No. 2.
3. *Lincoln.
4. *Royal Australian.
5. *White Eldorado.
6. *Rural No. 5.
7. *Shumaker × Clawson.
8. Blue Stem.
9. Sandomirka.

---

* Those marked with asterisk (*) in third group are very similar in appearance, having in each case almost typical Clawson heads. The others resemble the Clawson only in color.

FOURTH GROUP.

Characteristics.—Glumes awned and white, red kernel; head and kernel usually medium or large size.

1. *Alabama.
2. *American.
3. *Bearded Treadwell.
4. *Bennett.
5. *Democrat.
6. *Egyptian.
7. *Golden Prolific.
8. *Mich Wick.
9. *Nigger.
10. *Shaffer.
11. *Theiss.
12. *Valley.
13. *White Blue Stem.
14. *Wysor's Eureka.

FIFTH GROUP.

Characteristics.—Glumes awnless and white, red kernel; head and kernel usually small or medium size.

1. *Big Frame.
2. *Big May.
3. *Cornell No. 3.
4. *Diehl.
5. *Diehl × Egyptian.
6. *Early May.
7. *Emporium.
8. *Emporium Scott.
9. *Finley.
10. *Fultz.
11. *Golden Drop.
12. *Golden Straw.
13. *Heighes Prolific.
14. *Hungarian White Chaff.
15. *Kentucky White.
16. *Red Chaff.
17. *Red May.
18. *Rocky Mountain.
19. *Small Frame.
20. *Tennessee Amber.
21. *White Rose.
22. *Yellow Blue Stem.
23. *Yellow Missouri.
24. *Zimmerman.
25. Canadian Express.
26. Champion Amber.
27. Fultzo Clawson.
28. Heckman.
29. Palestine.
30. Rice.
31. Rogers.
32. Scott.
33. Scott's Smooth.
34. Travis.
35. York White Chaff.

SIXTH GROUP.

Characteristics.—Glumes awned and white; white kernel.

1. Smith's Improved.
2. White Rogers.
3. Wild Goose.

SEVENTH GROUP.

Characteristics.—Glumes awnless and white; white kernel.

1. *Armstrong.
2. *Arnold's Hybrid.
3. *Gold Medal.
4. *Tappannock.
5. *Treadwell Smooth.
6. Cornell, No. 1.
7. Grecian.
8. Ostery.
9. Porter.
10. Powers.
11. Rickenbrode.
12. Russian, No. 2.
13. Washington.
14. White Mountain.

The following come under this group according to color, but do not resemble the foregoing varieties much in other respects. Thus they form a group themselves.

1. *Landreth.
2. *Martin's Amber.
3. *Silver Chaff.
4. *White Mountain.

EIGHTH GROUP.

Characteristics.—Glumes awned, bronze colored, red kernel; heads medium size or large, spikelets arranged in distinctly opposite rows and closely packed on the rachis, giving the head a peculiar square appearance.

1. Andrews, No. 4.
2. Brady Lake.
3. Michigan Bronze.
4. Sibley's Hybrid.

NINTH GROUP.

Characteristics.—Glumes awnless and white, red kernel; resembles above in arrangement of spikelets, though not so closely set. Number 2 has bronze colored glumes.

1. American Eclipse.
2. Canada Club.
3. Wayne Co. Select.

MISCELLANEOUS.

Roscoe is a peculiar, small square set head, awnless bronze glumes.

There are several varieties called Velvet and Velvet Chaff, these are mostly characterized by a velvety fuzz on the chaff or glumes. They are awned bronze, and awnless white. We have several varieties, but the one of most importance and which the Station has distributed is a red chaff bearded variety with medium size red kernel.

WHEAT TESTS IN DIFFERENT PARTS OF THE STATE.

The Station has for three years endeavored to distribute as widely as possible such varieties of wheat as were thought most promising and not generally distributed. And has also endeavored to obtain the principal facts in regard to their success or failure.

In many cases the parties receiving the wheat have failed to report, and in some instances where they have reported from evident inaccuracies or omission of important facts the reports have been of questionable value.

We wish to say, however, that most of those reporting have done exceedingly well and furnished notes of value.

The selection of men to do local testing for the Station in different parts of the State is a matter of some difficulty as it is impossible for us to have a personal knowledge of but very few of those to whom seed is sent.

Possibly if county societies in different parts of the State would select one or two of their members, who should be considered the special agents of that society to look after work which the Station might wish to have done in their county, it would accomplish a great good in aiding the Station to secure reliable reports and such assistance as is desired.

In the first distribution one bushel of each variety, and usually two varieties were sent to each party. This was found to be quite expensive and it necessitated buying considerable seed which we have learned from experience is not the thing to do. The Station can have no guaranty of the purity of seed unless grown by ourselves, and from the very nature of work it is impossible to grow a large quantity of but one or two varieties. The Station has been imposed upon by persons selling us impure seeds which have not only caused the loss of that particular work, but have been a great injury in other respects.

That the Station should expend much of its means distributing seeds we do not concieve to be the intent of the law by which it was established, yet such work as can be judiciously done in this line is doubtless perfectly proper.

The distribution of wheat for the second year was in smaller quantities than the previous year, and last year entirely in small quantities (two to four quarts), in this manner reaching a much larger number of people. The smallness of quantity we have no doubt deters many from paying such attention to it as it should receive and from making as good a report upon it as they would have done with a larger quantity. But there is no good reason for this. Two quarts of seed will properly sow 10 square rods of ground—one-sixteenth of an acre—and if carefully sown this is sufficient to produce a yield of two or even three bushels, which is ample to produce a crop the following year that will furnish seed for several ordinary farms.

The distribution for last year was sent to over sixty farmers, reaching nearly sixty counties—less than 20 per cent. of these reported (or less than one in five). This is a poor showing and just so far deprives the Station of results which it ought to have. If such results are to be expected in the future it is not certain but that the Station must limit testing of varieties to a few paid agents. This would deprive it of means which are very much needed for other work and would not enable us to get as many reports from different sections of the State would certainly be desirable.

In the accompanying table is presented the main facts from this test of varieties. On account of lack of full reports from all parties it is not what we had hoped to present. Wherever any data is omitted from the table it is because the party omitted it from his report. The quantity sown, the area covered, and the yield from that area are given. This affords much better comparison, and shows what diverse results will be reached by different parties. The area sown is not absolutely correct inseveral instances, but as nearly so as could well be made from data furnished by those reporting. The following general conclusions from the tests and correspondence from different parts of the State are presented:

Fultz wheat, which for a time was waning, is regaining much of its popularity. Velvet Chaff is generally well received, though there are a few adverse reports. Finley is generally well received. York White Chaff and Rocky Mountain are favorably received; also Nigger and Valley. Royal Australian, Martin's Amber and Landreth are good white wheats and as such quite popular.

STATEMENT EXHIBITING RESULTS OF WHEAT TESTS IN DIFFERENT PARTS OF THE STATE.

County.	Party making test	Variety tested.	Soil.	Time of sowing.	Time of ripening.	Amount of seed sown.	Area sown—part of acre.	Amount of grain harvested.	Quality of grain.	Weight per bushel.
				1884.	1885.					*lbs.*
Miami	Elias Teeter	Tasmanian Red	Clay	Sept. 20	July 10	8 lbs.	1-10	84 lbs.	Good.	61.
"	"	White Rogers	"	20	13	8 lbs.	1-10	114 lbs.	Good.	61.
Seneca	Bert E. Rice	Velvet Chaff	Clayey loam with gravelly subsoil	17	10	4 lbs.	1-22	75 lbs.	Good.	....
"	"	Finley	" " "	17	6	4 lbs.	1-22	86 lbs.	Good.	....
Miami	M. E. Eidemiller	Rocky Mountain	Black alluvial soil	24	6	9 lbs.	1-8	180 lbs.	Good.	61.5
"	" "	Valley	"	24	6	11 bu.	9 acres.	240 bu.	Good.	61.
Sandusky	Wm. Kinney	York White Chaff	Gravelly loam	16	....	4 qts.	1-16	208 lbs.	Good.	....
Portage	C. W. Hart	McGhees Red	Clay loam	19	15	4 qts.	1-18	171 lbs.	Good.	62.5
Wood	Joseph Guy	Finley	Heavy Clay	27	18	2 qts.	1-20	91.5 lbs.	Fair.	61.
"	"	Velvet Chaff	"	27	23	2 qts.	1-20	96 lbs.	Fair.	58.
Trumbull	J. W. Woodford	"	....	22	....	4 qts.	1-20	105 lbs.	Good.	68.
Highland	J. G. Redkey	Finley	....	Oct. 8	5	4 lbs.	1-10	98 lbs.	Fair.	....
"	"	Velvet Chaff	....	8	2	4 lbs.	1-10	70 lbs.	Good.	....
Allen	Francis Y. Davis	Royal Australian	Clay loam	Sept. 26	9	2 qts.	1-14	125 lbs.	Very good.	....
"	" "	Nigger	"	26	7	2 qts.	1-14	74 lbs.	Fair.	....
"	" "	Finley	"	26	9	2 qts.	1-14	76 lbs.	Fair.	....
Seneca	D. T. German	"	Heavy clay	18	11	2 qts.	1-16	75 lbs.	Good.	61.

NOTES FROM THE DIFFERENT REPORTS.

Miami County.—"Wheat was sown after potatoes, ground not thoroughly harrowed and rolled. Clover in 1883; no manure used; yield up to the average, but all had about equal chance."

Seneca County.—"All plots were somewhat injured by ice during winter. Velvet Chaff, straw strong, stooled well, good berry. Finley stood up well, early, white caps, hurt appearance of grain; ground was treated with ordinary coat of manure."

Miami County.—"Wheat sown after clover, no manure. Rocky Mountain stood well, and plump grain. Valley: eleven bushels were sown instead of the small quantity sent by the Station, and yield is given from it accordingly."

Sandusky County.—"York White Chaff was tall and late, but very fine heads." Date of harvesting not given.

Portage County.—"Oat stubble well manured."

Wood County.—"Clover sod, both varieties wintered well. Finley some rusted and Velvet Chaff badly so, late seeding possible cause; yield better than other varieties sown."

Trumbull County.—"Egyptian complete failure from winter killing; Fultz here yielded thirty-five bushels per acre and Finley fourteen."

Highland County.—"Sowed after sweet corn, manured twenty loads per acre. sowed broadcast."

Allen County.—"Oat stubble dressed with horse manure and rotten chips; fifteen loads to the acre."

Seneca County.—"Finley was as nice wheat as I ever saw; straw strong but not harsh."

GENERAL NOTES ON WHEAT CULTURE.

The total wheat production of the United States for the year 1885 was 30 per cent. less than that of 1884, the average yield per acre being about 10.5 bushels.

For the first time in many years the average yield per acre in Ohio has fallen a little below the average for the whole country. This decline is mainly due to the unusual severity of the winter of 1884–5. Specially favored as Ohio is for wheat production, the possibilities being shown by the remarkable average of 19.5 bushels per acre in 1880, it is doubtful under the present system of cultivation whether an equally high average will ever again be reached.

The results following similar methods in other States may be summarized as follows:

In New York during twenty years the average yield has declined from 13 to 10.3 bushels per acre. In Indiana during ten years the decline is from 14 to 10.4 bushels. In Illinois, for the same period, from 14 3 to 10.4 bushels.

These facts are significant if not startling. How is this tendency toward diminished production to be overcome?

There is but one way: Greater care in the selection of seeds; a more thorough preparation of the soil, including better drainage; a careful saving and more generous application of manures. This, and this only, can preserve to Ohio, the rank she now holds as a wheat producing State.

Of the crops usually cultivated and sold in this country, wheat is the most exhausting, yet it may be one of the most profitable.

"In view of the low prices, cheap land and facilities for transportation, would you advise me to give up wheat culture for the present?" is, in substance, a question frequently asked. The Station's answer has invariably been as follows: If your farm yields good crops of wheat, averaging larger now than they did ten years ago, such crops will rarely fail to return a profit. If your land is too poor to raise a good crop, don't throw away time and money by growing poor ones.

In these times of over production and consequent low prices only good crops will pay. If, baring accident, your wheat crop has regularly increased from year to year, better continue, even though the profit at present is small.

The low prices and general depression in wheat culture mainly affects those who are starving the goose that lays the golden egg. You can't continue to take eggs to market if you will persist in taking the hen along.

As a rule, the risks attending the raising of wheat are greater in other countries than in our own, and in all probability our surplus will soon be needed to make up for failures abroad.

EXPERIMENTS WITH CORN.

In the work with corn the Station has sought to deal with the same general subjects as heretofore. The work has been extended somewhat, especially with varieties. With fertilizers, and in methods of culture, the object has been to study those points of greatest interest from a practical standpoint. For several years the Station has been making a careful study of varieties of corn, but the question of what are varieties is found to be a very perplexing one. That there are five distinct races of corn, as Dent, Flint, Sweet, Pop, and Soft corn, all are well aware. These divisions are quite plainly marked, and can usually be determined with ease by inspection of the ears, and to a certainty, by the structure of the kernel. Whether these divisions should be recognized as species, and the numerous forms and types of ears under each considered as varieties, is a question difficult to answer.

It is true, that these divisions lack some of the points of difference which constitute a species among natural orders of plants, but they have strong points of difference, which, to the agriculturist, makes them in reality species, or possibly the better word is races. They must be considered as dintinct species or races if one is to use the term variety when speaking of the different types of each. That there are differences of type and character of growth under each of these five divisions which are worthy of being considered varieties, no one who has studied the subject will doubt. We cite as variety differences the characteristics of color which are found to differ through each race or species, furnishing red, white, and yellow ears, with various mixtute of these colors; also eight rowed and many rowed samples, which invariably produce ears true to their type when kept from other varieties. But whether we are to go further with variety differences than is indicated in the above is extremely doubtful. The Station has grown a large number of varieties of corn, and examined carefully many varieties grown elsewhere. Among these there have been many samples of large yellow dent ears, all bearing names, some few of which were well known, but mostly of purely local significance. It is safe to say that out of the large number of so called varieties examined not one half dozen samples could have been selected which could be described as different varieties. What is said of this might be said with equal force of other types. This lack of characteristic differences between so called varieties has led to the desire to put the nomenclature of corn on a better basis. Just how this is to be accomplished is not so easily determined, but the following scheme which has been outlined in previous reports is again presented:

	Races.	**Classes.**	**Types.**
Natural species (*Zea Mays*)	**Dent............**	**Yellow............**	**1. Large.**
	Flint............	**White.............**	**1. Medium.**
	Etc.	**Etc.................**	**3. Small.**

Under the division of types there is ample scope for variety names, but these should not be applied except to those sufficiently marked to be easily recognized and accurately described.

It is hardly necessary to state that Indian corn is a member of the natural order *Gramineæ* or grass family, and belongs to the genus *Zea*, and to the particular species called *Zea Mays*. Under the classification as given above, we consider the five divisions previously mentioned as races of this species.

With the study of varieties comes another and perhaps more important idea than an attempt at proper nomenclature. It is this: what are the points of an ideal variety and their value? This matter of establishing a standard of excellence would seem on careful thought to be of first importance in the study of varieties.

In attempting such a standard it is but natural that there should be a considerable difference of opinion as to the prominence certain features of a type should have. In setting forth a perfect or ideal ear no reference can be had to characteristics of growth, as ears to stalk, ease of husking, etc., etc.; these are points of the perfect plant, and should, so far as possible, be combined with the perfect ear. The first and prime point in an ear of corn is the nutritive substance that it contains. Hence, an ideal variety should contain a proper proportion of protein carbo-hydrates and fat. From the volume of "Statistics of Agriculture," collected by the tenth census, we copy the following figures:

ANALYSES OF MAIZE KERNEL—DENT VARIETIES.

	Water.	Ash.	Albuminoids. (*Protein.*)	Fibre.	Carbo-hydrates. (*Starch, gum, etc.*)	Fats.
Average (26 anlyses)........................	11.23	1.48	10.49	1.91	70.15	4.74
Maximum	15.24	1.79	11.75	2.95	75.26	6.28
Minimum..	6.22	1.23	8.05	1.25	66.26	3.80

These analyses doubtless fairly represent the composition of Dent corn, and this discussion is intended to apply to this race only.

In an ideal variety it would be desirable to maintain the maximum amount of albuminoids given in the above table, though it should be done at the expense of the carbo-hydrates. In fact it would seem to be desirable to make corn, which is the great stock food of the country, a more evenly balanced ration. In what measure this could be effected by selection, remains to be seen. Doubtless something might be realized from this source. The Flint varieties, and also the Sweets, show a higher nutritive ratio than the Dents. The determination of the nutritive value of corn is a matter for the chemist and cannot be determined by inspection, but as indicative in this line the kernels which contain the greatest amount of corneous matter are considered to be richest in albuminoids. Passing the matter of chemical composition, let us notice the ear. The matter of first importance here is that it yield as great a per cent. of kernel as is possible without injuriously weakening the cob.

Around this should be grouped the lesser points, which may all be said to culminate in this one. Yet for the purpose of outlining the ideal ear, we extend the number of points. The values here given are comparative, and if they apply at all are equally suited to corn in Maine or Ohio. Yet, when expressing their values in numbers, it would be necessary to use a different standard for the several great sections of our country which produce corn.

From our examination and study of the Dent corn here at the Station, these values in numbers may be expressed as follows:

Points.	Value of each.
Greatest per cent. of shelled corn	40 points.
Trueness of type	10 "
Evenness of diamaters	10 "
Length of ear	10 "
Number of rows	5 "
Size and shape of kernel	10 "
Hardness of kernel	15 "
Total	100 points.

This scale might be considerably extended, but this would be a needless division of the separate values attached to each. This division is ample for all comparison, and all points of interest can be included under one of the above heads. Chemical composition is not included, for the reason that this cannot be determined by inspection. High value is given to the physical character of hardness, with the belief that with this quality goes that of a large per cent. of protein. All analyses which we have studied teach this.

In giving value to the above points, or, in other words, completing our standard for this section, the data is furnished from experience derived at the Station.

We do not take into consideration the matter of color, for it is well proven that chemically there is no difference between these two classes of the Dent race; however, there may be a decided difference observed between two samples grown under unequal conditions, but none on the general average of analyses of samples.

In giving value to those points which relate to the dimensions of ear we must be sure to take dimensions within a given size, which will mature in this latitude. In applying these dimensions to the general crop of any locality, the variations allowed from the standard should be above for localities having longer seasons, and below for those having shorter ones. For this latitude it is safe to assume 110 days for the average corn season, the facts from meteorological observations showing that this is rather below than above the average season.

We here present the accumulated evidences of our study, from which the points of size, etc., for the standard type of ear are selected.

There were forty-four samples of Dent corn used in the Station tests the past year belonging to the white and yellow classes, as follows, 20 of the former and 24 of the latter.

The different points of comparison are best shown by a table:

Basis of comparison.	Average length of ear, inches.	Average number of rows.	Average yield, bushels.	Average weight of cob to bushel of shelled corn.	Average time of ripening.
44 varieties, 24 yellow and 20 white	8.6	16	88.6	11.19	Sept. 13.
20 varieties, having an average of 14 rows and less	8.7	*14	86.0	11.6	" 12.
24 varieties, having an average above 14 rows	8.4	18	91.3	10.8	" 14.
Varieties ripening Sept. 12th and under, 26 in number	8.4	16	81.0	10.6	" 9.
Varieties ripening after Sept. 12th, 18 in number	8.7	16	100.8	12.1	" 18.

In the first instance, the average date of ripening is a little late, being 111 days from vegetation, the extremes of ripening being September 6th and 24th. (Only yellow and white Dents are included in the comparison.) Comparisons can now be made to eliminate this difficulty of date, and also to ascertain the points of greatest development. For example, the comparison of the many rowed sorts with those having fewer rows. This shows the fewer rowed sorts to have generally the longer ears, to yield less per acre, and to have above the average weight of cob, and the ripening to be *but one day* earlier than the average coming just within the limits of 110 days. Per contra the many rowed sorts have a trifle shorter ear, a marked increase in average number of rows, a slight increase in yield, nearly one pound less cob per bushel of shelled corn, and to ripen two days later. This comparison does not bring out the strong points sought for in a division, which shall show wherein lies the best typical variety for selection. Hence, the comparison as to date of ripening; as the basis of this we take the date just 110 days from vegetation, and put all which fall within it in date of ripening into one class, and all which ripen later in another. This comparison brings out the strongest points of any. The average length of the earlier ripening sorts is slightly below the average of all samples; the rows are equal in both divisions of this comparison; the yield of the earlier sorts is considerably less, but this is in part accounted for by the greater dryness of the samples. The weight of cob to shelled bushel is very much less than in the later sorts, and the date falls three days within the limit of time.

Examining this group which ripens within the limit above mentioned, we find the following points of excellence: McCoy corn shows the lowest weight of cob to bushel of corn of all varieties tested; Clarage shows the least weight of stalks to one hundred pounds of corn of all varieties; Munn shows an actual yield of ninety six bushels per acre, or, corrected to perfect stand, one hundred and seven bushels per acre. In all but yield, this group embraces all of the best individual points of any in our test, hence we combine its best results for particular dimensions of ear as follows:

Length of ear, not less than eight inches or more than nine; diameters—butt, $1\frac{7}{8}$ to 2 inches; middle, same; tip, 1 4-8 to $1\frac{5}{8}$ inches; cob should constitute eleven to fifteen per cent. of entire weight, not more; as to number of rows, the evidence is not definite, but all points to the conclusion that they are increased up to a certain limit to the advantage of the ear in yield of shelled corn; just what that limit is can not be given with accuracy, but the evidence seems to indicate that not less than sixteen rows should be required for a standard variety, and that twenty are not detrimental to good results. The size and shape of kernel are very important, but can only be given in words to this effect, that they should be of good depth and such shape as to fill the ear compactly, leaving a smooth surface, free from furrow or sulcus. Hardness of kernel can only approximately be determined by inspection, but the points are that the kernel be well glazed, well filled up at the end, the dent being simply a round dimple or slight longitudinal depression. All wrinkling of the end is to be avoided, as this indicates that the corneous matter does not reach near enough to the surface. The ideal kernel that we should prefer would be wedge-shaped, presenting an almost square end to the surface of the ear.

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* There were only five varieties having *less* than 14 rows; this made the average of rows 13.5, but we give it in the table as 14, for it is well known that varieties do not have odd number of rows.

TESTS OF VARIETIES.

We here present the entire tabulated results of the field tests of varieties, and also the examination for additional study. All weights, except those for yield, were made from samples after being properly dried. The critical examination and study was made from ten average ears selected from the corn as it lay in the field. All plots were planted May 19th, vegetated the 25th, all were given the same care. The season was quite favorable, and though some varieties were very late, they were well matured, and no soft corn is reported.

TABLE I.—GIVING YIELD AND DATE OF RIPENING.

Field number.	Variety.	Total bushels sound corn.	Average ears to each stalk.	Weight of stalks.	Weight of stalks to 100 lbs. of corn.	Per cent. of ears.	Per cent. of nubs.	Time of ripening.	Yield corrected to full stand.
	Flints.			*lbs.*	*lbs.*				
63	Large Yellow	70.9	.95	5,544	112	85	15	Sept. 1	72.8
64	Compton's Early	36.5	.90	2,217	87	70	30	Aug. 25	50.6
65	Longfellow	51.5	1.13	3,234	90	74	26	25	53.8
66	Waushakum	45.2	1.05	3,049	97	74	26	20	54.7
67	Golden Dewdrop	50.1	1.21	2,772	80	72	38	25	52.7
68	Top Over	43.5	1.05	4.620	151	66	34	Sept. 1	48.3
69	White Flint	55.9	1.33	3,826	86	67	33	1	60.4
70	King Phillip	40.7	1.02	2,310	82	72	28	Aug. 25	46.1
	Dents—Yellow.								
71	Chester Co. Mammoth	111.5	1.10	7,140	89	70	30	Sept. 15	123.9
72	*Leaming	84.3	.92	5,082	87	58	42	6	91.0
73	Leaming	88 7	1.00	4,158	70	70	30	12	93.6
74	Farmers' Favorite	105.0	1.02	6,468	88	78	22	24	113.4
75	Golden Beauty	51.6	.93	4,158	115	73	27	15	102.8
76	Maryland	66 3	.90	2,772	60	69	31	15	86.6
77	Riley's Favorite	88.9	1.00	4,158	63	79	21	12	94.4
78	Munn	96.0	1.03	4,620	69	88	12	10	107.0

79	Robinson's Golden	112.5	.98	6,468	82	73	27	23	117.0
80	Perfection	63.2	1.01	3,234	73	51	49	10	70.2
81	Pride of the North	70.8	.94	4,620	93	81	19	12	78.6
82	Scott's Dent	75.2	.94	4,158	79	78	22	12	82.1
83	Golden Blossom	80.8	.93	5,082	90	78	22	12	87.6
84	Hill's Best	81.8	1.00	3,696	64	78	22	6	85.5
85	Golden Dent	48.3	1.02	2,802	82	72	28	8	69.3
86	Illinois Premium Dent	99.3	1.02	6,462	93	84	16	24	109.7
87	Smith's Improved	86.1	.94	5,359	90	73	27	8	91.2
88	Thompson Corn	68.3	.92	5,082	107	57	43	10	77.3
89	McCoy Corn	55.3	.85	4,158	108	61	39	8	61.7
90	Shively	72.9	.97	4,804	95	72	28	7	76.6
91	Golden Beauty	95.5	.97	8,316	125	79	21	23	99.4
92	Bounds	77.5	1.05	3,696	70	76	24	12	99.0
93	Improved Clarage	80.8	.95	5,082	90	68	32	12	86.6
94	Willison's Yellow	70.4	.92	5,266	107	76	24	12	81.3
96	Clarage	92.7	1.15	3,696	60	77	23	7	95.6
97	Small Dent	65.3	1.02	3,788	83	63	37	7	69.2
115	Golden Dent	37.9	1.03	3,049	116	55	45	15	43.7
120*a*	Ohio Farmers' Choice	58.1	1.00	2,956	80	61	39	10	66.2
120*b*	Orange	58 0	.93	4,420	116	74	26	14	69.6
123	Lieurance	80.3	.96	3,880	69	69	31	23	83.6
	Dents—White.								
95	White Cap	62.5	1.07	3,880	90	68	32	Sept. 6	67.3
105	Number One	58.7	.95	3,511	85	56	44	7	62.8
99	Hiawassee	108.5	1.07	6,468	85	83	17	23	116.2
100	Mammoth White Surprise	96.3	1.03	6,652	99	80	20	14	129.5
101	Boone County White	†8.6	.85	554	92	71	29	14	98.6
102	Watkins' White	103.7	.93	6,006	83	86	14	17	109.4
103	Hampden's Prolific	112.3	1.04	5,636	72	71	29	14	116.9
104	Union County White	†38.6	.83	2,125	80	75	25	12	77.2
106	Horse Tooth	115.0	1.12	9,702	121	78	22	25	118.0
107	Champion White Pearl	83.1	1.00	4,285	76	71	29	15	85.0
108	Beard's White Pearl	86 9	1.05	4,620	76	80	20	7	91.3
109	Pedan's White	47.3	.86	2,956	89	65	35	7	51.5
110	Early Dawn	84.3	1.00	4,712	80	80	20	10	87.3
122	Custis' White	82.9	1.05	3,973	69	77	23	20	92.1

TABLE I.—Concluded.

Field number.	Variety.	Total bushels sound corn.	Average ears to each stalk.	Weight of stalks.	Weight of stalks to 100 lbs. of corn.	Per cent. of ears.	Per cent. of nubs.	Tipe of ripening.	Yield corrected to full date.
	Miscellaneous Dents.			*lbs.*	*lbs.*				
98	Calico	54.9	.97	3,234	84	69	31	Sept. 1	63.1
111	Terrell's Mixed	98.3	.80	4,959	73	58	42	15	103.7
112	Bloody Butcher	89.6	.96	3,880	62	74	26	15	95.4
113	Robinson's Mixed	102.6	1.00	5,451	76	78	22	24	122.1
114	Speckled	68.4	1.09	3,234	70	65	35	10	80.6
118	Pusey's Crossbred	62.3	.98	3,696	85	49	51	7	67.6
	Softs.								
116	‡Mandan Indian	....	....	....	....	....	....	Aug. 20	....
117	Squaw	39.4	....	2,310	89	66	34	Sept. 7	48.2
119	‖Clark's Flour	....	....	....	....	....	....	....	....
121*a*	R. N. Y. Crossbred	24.7	....	924	53	44	56	1	20.1

* These samples called Leaming were from different sources and quite different type. See descriptive notes.
† These varieties were of low vitality as shown by our test before planting. Only a small per cent. grew in one case.
‡ Only a few small ears, and no yield is given.
‖ None matured.

The seed of all varieties was tested before planting, and the amount which vegetated corresponded, so far as observed, very closely with the germination test, but, unfortunately, complete observation on the vegetation of all varieties was overlooked until some of the plants had been removed. Otherwise this would have furnished excellent comparison of the per cent. of vegetation with the germination test.

Table II. presents some important facts in regard to size and weight of ears and cobs.

The length of ear is the average of the variety as grown at the Station the past season.

TABLE II.

Field number.	Variety.	Length of average ear.	Rows on average ear.	Kernels on average ear.	Diameters.			Average diameter of cob.	Weight of average ear.	Weight of average cob.	Weight of corn on average ear.	Number of average ears in bushel of 70 pounds.	Number of average ears in shelled bushel of 56 pounds.	Weight of cob required to make bushel of 56 pounds.	Kernels in one ounce.
					Butt.	Middle.	Tip.								
	Flints.	*Inches*			*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Ounces.*	*Ounces.*	*Ounces.*			*Lbs.*	
63	Large Yellow	11 6-8	8	456	1 13-16	1 11-16	1 3-16	1	9 7-8	2	7 7-8	114	114	14	59
64	Compton's Early	10 3-8	12	597	1 13-16	1 10-16	1 2-16	1	7 4-8	1 2-8	6 2-8	149	143	11.2	91
65	Longfellow	9 1-8	8	371	1 8-16	1 7-16	1 2-16	13-16	6 2-8	6-8	5 4-8	179	163	7.6	73
66	Waushakum	10 2-8	8	394	1 7-16	1 7-16	1 2-16	13-16	7 2-8	1	6 2-8	154	143	8.9	59
67	Golden Dewdrop	9	8	392	1 8-16	1 7-16	1 2-16	14-16	6 2-8	1 1-8	5 1-8	179	175	12.3	68
68	Top Over	8 4-8	8	346	1 8-16	1 8-16	1 2-16	14-16	6 5-8	1	5 5-8	169	159	9 9	58
69	White Flint	9 5-8	8	394	1 9-16	1 7-16	1 1-16	14-16	6 5-8	1 1-8	5 4-8	169	163	11 4	70
70	King Phillip	8 4-8	8	373	1 8-16	1 6-16	1 1-16	13-16	5 4-8	7-8	4 5-8	204	194	10 6	62
	Dents—Yellow.														
71	Chester County Mammoth	9 1-8	16	687	2 5-16	2 1-16	1 9-16	1 4-16	13 5-8	2 3-8	11 2-8	82	80	11.9	70
72	Leaming	8 5-8	20	849	2 5-16	2 2-16	1 9-16	1 4-16	13 1-8	2 1-8	11	85	81	10 8	73
73	Leaming	9 1-8	16	784	2 1-16	2	1 6-16	1 2-16	12 3-8	1 7-8	10 4-8	91	85	9 9	77
74	Farmers' Favorite	9	16	816	2 3-16	2 1-16	1 8-16	1 1-16	12 5-8	2 2-8	10 3-8	89	87	12.0	88
75	Golden Beauty	9 2-8	14	675	2 3-16	2 1-16	1 8-16	1 1-16	13 1-8	1 7-8	11 2-8	85	80	9.4	56
76	Maryland	8 7-8	16	699	2 5-16	2 2-16	1 11-16	1 2-16	13 6-8	2 2-8	11 4-8	82	78	11.0	67
77	Riley's Favorite	9 2-8	18	1020	2 3-16	2 1-16	1 8-16	1 3-16	13 4-8	2	11 4-8	83	78	9.8	78
78	Mnnn	9	20	918	2 3-16	2 1-16	1 6-16	1 4-16	12 6-8	2	10 6-8	88	83	10.4	80

79	Robinson's Golden	8 5-8	20	994	2 6-16	2 5-16	1 11-16	1 7-16	15	3	2	75	75	14.0	
80	Perfection	7 1-8	22	983	2 3-16	2	1 5-16	1 2-16	10 4-8	1 6-8	8 6-8	107	105	11.2	10
81	Pride of the North	10	14	678	1 15-16	1 13-16	1 5-16	1	10 5-8	1 4-8	9 1-8	105	98	9.2	84
82	Scott's Dent	8 7-8	14	724	1 15-16	1 14-16	1 6-16	1 1-16	10 6-8	1 5-8	9 1-8	104	98	9.9	80
83	Golden Blossom	8 2-8	20	799	2 4-16	2 2-16	1 7-16	1 3-16	12	2 1-8	9 7-8	93	91	9.6	81
84	Hill's Best	8 2-8	14	650	2 1-16	1 15-16	1 7-16	1 2-16	11	1 6-8	9 2-8	102	97	10.6	73
85	Golden Dent	7 5-8	16	734	2 1-16	2	1 6-16	1 2-16	9 6-8	1 3-8	8 3-8	115	107	9.2	86
86	Illinois Preminm Dent	9 1-8	18	957	2 4-16	2 2-16	1 7-16	1 2-16	13	2	11	86	81	10.1	79
87	Smith's Improved	9 4-8	12	637	2 2-16	1 15-16	1 5-16	1 2-16	12 3-8	2 6-8	9 5-8	91	93	16 0	60
88	Thompson	8 5-8	18	774	2 3-11	2 2-16	1 10-16	1 4-16	12 5-8	2 1-8	10 4-8	89	85	11.3	66
89	McCoy	7 7-8	14	663	1 14-16	1 14-16	1 6-16	1	9 4-8	1 1-8	8 3-8	118	107	7.5	77
90	Shively	8 2-8	14	657	2	1 14-16	1 8-16	1 2-16	10 4-8	1 4-8	9	107	99	9.3	69
91	Golden Beauty	9	14	628	2 2-16	2	1 7-16	1 2-16	11 4-8	2 3-8	9 1-8	97	98	14.5	63
92	Bounds	9 1-8	16	739	2 2-16	2 1-16	1 7-16	1 4-16	12 4-8	2 3-8	10 1-8	90	68	13 1	81
93	Improved Clarage	9	16	865	2 4-16	2 1-16	1 7-16	1 2- 6	13 1-8	1 6-8	11 3-8	85	79	8.6	75
94	Willison's Yellow	8 6-8	14	627	2 1-16	1 15-16	1 6-16	1 2-16	11	1 6-8	9 2-8	102	97	10.6	63
96	Clarage	8	14	690	2 1-16	1 15-16	1 7-16	1 1-16	10 4-8	1 6-8	8 6-8	107	102	11.1	92
97	Small Dent	8	18	820	2	1 14-16	1 4-16	1 1-16	10 3-8	1 5-8	8 6-8	108	102	10.4	91
115	Golden Dent	7 4-8	18	840	2 1-16	1 15-16	1 8-16	1 2-16	10 1-8	1 5-8	8 4-8	111	105	10.7	81
120a	Ohio Farmers' Choice	7	16	612	2	1 14-16	1 6-16	1 1-16	8 1-8	1 2-8	6 7-8	138	130	10.1	81
120b	Orange	8 6-8	14	845	2 2-16	2	1 7-16	1 3-16	10 3-8	2 1-8	8 2-8	108	109	14.5	84
123	Liturance	8 2-8	18	826	2 1-16	2	1 7-16	1 2-16	10 4-8	1 4-8	9	107	99	9.2	88
	Dents—White.														
95	White Cap	7 5-8	14	642	1 12-16	1 11-16	1 5-16	1	8	1 2-8	6 6-8	140	133	10.2	102
105	Number One	7 7-8	12	524	2 2-16	2	1 7-16	1 3-16	10 4-8	2 4-8	8	107	112	17.5	64
99	Hiawassee	9 1-8	12	624	2 4-16	2 2-16	1 8-16	1 3-16	13 2-8	2 4-8	10 6-8	85	83	12.6	65
100	Mammoth White Surprise	9 6-8	12	566	2 4-18	2 2-16	1 10-16	1 3-16	15 2-8	3 4-8	11 6-8	73	76	16.6	48
101	Boone County White	8 4-8	18	777	2 5-16	2 6-16	1 12-16	1 6-16	13 2-8	2 4-8	10 6-8	85	83	13.0	64
102	Watkin's White	9	14	518	2 6-16	2 2-16	1 10-16	1 4-16	14 1-8	2 6-8	11 3-8	79	79	13.6	68
103	Hampden's Prolific	7 7-8	18	807	2 5-16	2 4-16	1 10-16	1 4-16	13 3-8	2 1-8	11 2-8	84	80	10.6	75
104	Union County White	8 1-8	16	751	2 3-16	2 1-16	1 6-16	1 2-16	12 5-8	1 4-8	11 1-8	89	81	7.6	84
106	Horse Tooth	8 1-8	16	735	2 3-16	2 2-16	1 11-16	1 2-16	11 7-8	2	9 7-8	94	91	11.4	80
107	Champion White Pearl	7 7-8	14	723	2 1-16	2	1 7-16	1 2-16	10 4-8	1 6-8	8 6-8	107	102	11.1	83
108	Beard's White Pearl	8 2-8	18	8'8	2 2-16	2	1 7-16	1 4-16	11 5-8	2 2-8	9 3-8	97	96	13.5	76
109	Peden's White	8 5-8	12	547	1 14-16	1 13-16	1 4-16	15-16	9 1-8	1 2-8	7 7-8	123	114	8.9	73
110	Early Dawn	8 1-8	14	651	2	1 14-16	1 7-19	1	10 3-8	1 4-8	8 7-8	108	101	9.5	76
122	Custis' White	9 2-8	14	715	2	2	1 6-16	1 1-16	10 5-8	1 6-8	8 7-8	105	101	11.0	80

TABLE II.—Concluded.

Field number.	Variety.	Length of average ear.	Rows on average ear.	Kernels on average ear.	Diameters.			Average diameter of cob.	Weight of average ear.	Weight of average cob.	Weight of corn on average ear.	Number of average ears in bushel of 70 pounds.	Number of average ears in shelled bushel of 56 pounds.	Weight of cob required to make bushel of 56 pounds.	Kernels in one ounce.
					Butt.	Middle.	Tip.								
	Miscellaneous Dents.	*Inches.*			*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Ounces.*	*Ounces.*	*Ounces.*			*Lbs.*	
98	Calico	7 5-8	16	635	2	1 15-16	1 6-16	1 1-16	9 3-8	1 2-8	8 1-8	119	110	8.6	88
111	Terrell's Mixed	8 6-8	16	718	2 2-16	2 1-16	1 8-16	1 3-16	11 6-8	2	9 6-8	95	92	11.4	68
112	Bloody Butcher	8 7-8	16	841	2 2-56	2 1-16	1 8-16	1 3-16	12 6-8	2 1-8	10 5-8	87	84	11.1	93
113	Robinson's Mixed	9.2	16	868	2 5-16	2 3-16	1 9-16	1 6-16	14 4-8	3 1-8	11 3-8	77	79	15.4	77
114	Speckled	8 2-8	12	531	2	1 14-16	1 6-16	1 1-16	9	1 3-8	7 5-8	124	118	10.1	80
118	Pusey's Crossbred	6 5-8	16	670	2 2-16	2 2-16	1 9-16	1 4-16	10 6-8	1 7-8	8 7-8	104	111	11.8	87
	Softs.														
116	Mandan Indian	4 5-8	8	201	1 5-16	1 5-16	1 1-16	10-16	2 2-8	2-8	2	498	448	7.0	105
117	Squaw	9 6-8	8	367	1 11-16	1 10-16	1 2-16	15-16	6 6-8	1 4-8	5 2-8	166	171	16.0	67
119	*Clark's Flour	....	....	....	....	....	....	....	....	....	....	....	....	....	....
121a	R. N. Y. Crossbred	9 3-8	8	352	1 10-16	1 8-16	1 4-16	15-16	5	1	4	224	224	14.0	71

* Did not mature.

Especial attention is called to the fact, that, while legally the cob from a bushel of shelled corn is 14 pounds, the average from Station tests of forty-four Dent varieties is nearly three pounds less than this. The samples for this examination were not specially dried, but kept under ordinary conditions.

The foregoing tables furnish a mass of facts which will be more fully discussed in subsequent publications after further observations are completed. A few words here as to variety selection. Probably there are not more than half dozen so-called varieties of the Dent race which are well fixed, and of those few which do seem quite well established, very little can be said in praise. The Station would counsel all interested in establishing a good variety of corn suited to their locality to loose sight of all variety names so far as attaching any peculiar potency to them is concerned, and to select of the corn in their own locality the best possible type, and from this choose seed from the best ears until it is bred to the required standard.

The exchange of seed corn over any wide extent of territory is a mischievious practice, and usually works harm. The idea that several types must occasionally be mixed and planted together to secure a cross, and thus improve the seed is also a very erroneous one. For out of the chaos of types, resultant from any cross, a pure type must again be selected before you are on the road to success. It is a well established fact that the pollen of the individual corn plant does not fertilize the silk of that plant, except to a very limited extent.

The above statements have been verified by repeated observations and tests here at the Station. Improvement "by selection of existing types, and keeping the type pure," are the watchwords of the farmer who courts success.

CROSS FERTILIZATION.

From many tests, conducted specially to investigate this point, the conclusion is reached that well established varieties do not show the effect of cross-fertilization the first year to any appreciable extent. This applies to well established varieties which have long been kept pure from foreign pollen. In no instance has a variety failed to show the effect of foreign pollen in the crop next succeeding the cross, where the plant was deprived of its own variety pollen. Dr. Sturtevant, of the New York Experiment Station, has, by careful tests, shown that a pure-bred variety may be exposed to foreign pollen for a succession of years without being affected by it, and has maintained itself pure, to all appearances. This might furnish some basis for an argument that corn could be bred so pure as to resist foreign pollen. However much may be possible in this line, it may be said that much would be gained if a whole community, where the conditions were similar, could adopt a single variety of corn, and by common consent select toward a perfect standard. This would go a long way towards doing away with so many useless sorts, and would make pur breeding possible.

DESCRIPTIVE NOTES OF VARIETIES.

The following sorts grew side by side, and the flow of pollen from one to another was uninterrupted; wherever the effects of current cross-fertilization were observed in this crop it will be given in the notes. The notes are very brief in most cases. Descriptive notes were made from crop planted, and then usually follow notes of crop of this year.

It should be stated here that the kernels of but one ear was used in planting; hence, the difference in type of ear and kernel in the crop is all the more striking.

63. Large Yellow Flint. (Henderson.) A very fair sample of large Flint

corn, heavy at butt, tapers considerably toward the tip. No effects of foreign pollen observed.

(All points, as lengths, diameters, etc., are given in the table.)

64. Compton's Early. (Henderson.) A large Flint, having an average of about 12 rows; kernels small and compactly set on cob; large butt and tapers considerably; no crossing observed.

65. Longfellow. (Henderson.) A fair sample of Yellow Flint. No cross-fertilization observed.

66. Waushakum. (Blount.) Notes as previous one.

67. Golden Dew Drop. (Henderson) Notes as two previous ones. Crop shows distinctly three types ot ear.

68. Top over. (Bragg & Co.) Fine sample, even diameters, peculiar large kernels; crop very untrue to type, and having few typical ears.

69. White Flint. (Henderson) Only fair; showed two types of ear; crop verv much mixed with yellow kernels.

70. King Philip. A very good sample of this variety, even and regular; crop was true in color, but one ear was exactly the type of Compton's Early.

DENTS.

71. Chester Co. Mammoth. (Henderson.) A very fair sample of large Dent; rows quite regular; kernels evenly dented; slightly rough; furrow very slight; pale orange color at end of kernels, and deeper below; cob red, not well filled at tip; crop even and true to type, but has some white kernels.

72. Leaming. (W. J. Mathie.) A fine typical sample of Leaming; heavy butt, tapers considerably; rows quite regular; kernels rectangular, ends evenly dented; furrow almost wanting; bright orange; cob red; crop, rows, and kernels untrue, and some ears not typical.

73. Leaming. (J. K. Bradfute.) Not Leaming, at least not selected after type grown by the originator; a very fair large yellow Dent; rows irregular, tapers considerably in lower third, kernels rectangular, evenly dented and rough; light orange; cob red; crop very much degenerated from sample.

74. Farmers' Favorite. (Henderson.) Fair sample; not well filled at points; slightly tapering, rows regular; kernels evenly dented; part of sample rough, rest smooth on surface; furrow well marked on some and not on other ears; light orange; cob red; crop, coarse, inferior looking corn; rough and mixed with white.

75. Golden Beauty. (E. A. Prior.) Fair, large specimens; rows quite even; not well filled at tip; kernels evenly dented, smooth and flat in shape; furrow slight; pale orange; cob red; crop looks poor and inferior; ears quite true to type; some white kernels.

76. Maryland. (W. M. Woodworth.) Poor sample, ill-shaped; tip small and deflective; butt large and bulging; rows fairly uniform and straignt; kernels evenly dented, slightly rough; furrow slight; pale orange; cob red.

77. Riley's Favorite. (James Riley.) Very fair sample, slightly tapering; rows uniform; kernels evenly dented, good length, very rough; furrow slight; orange above and darker below; cob red; crop fair; two types of ear.

78. Munn. (James Riley.) A good sample; in some characteristics resembling Leaming; tapers some at points; well filled; even, straight rows; kernels evenly dented and smooth; furrow slight; orange color; cob red; crop good; quite true to tyye; some white kernels.

79. Robinson's Golden. (Wm. Robinson.) A very large sample of corn, with nothing to commend it; uneven, rough; furrow broken; color, light orange, and cob red; crop poor and rough; three types of kernel.

80. Perfection. (A. Woodling & Son.) A very characteristic variety; ears short; thick at butt and well filled; tapering considerably to tips, and well filled there also; rows uneven and irregular; kernels small, many shaped, and unevenly dented; smooth surface; furrow wanting; pale yellow; cob red; crop very true to type; slight trace of cross fertilization.

81. Pride of the North. (James Riley.) Very fair sample; quite uniform diameters; rows even, well filled at points; kernels evenly dented and smooth; furrow slight; bright orange; cob red; crop good, true to type; traces of cross-fertilization.

82. Scott's Dent. (James Scott, Jr.) A very fair sample; uniform diameters; well filled at points; rows even and regular; kernels evenly dented, slightly rough; furrow slight; bright orange; cob red; crop fair; quite true; traces of cross-fertilization.

83. Golden Blossom. (W. M. Woodworth.) Sample only fair; ill-shapen; rows fairly regular; points imperfect as to filling; kernels much resembles Leaming; evenly dented and smooth; furrow slight; bright orange; cob red; crop fair, two types of ear.

84. Hill's Best. (Woodworth.) Only fair; decidedly tapering; tip small and pointed; rows quite even; kernels evenly dented and smooth; furrow slight; orange and deep yellow; cob red; crop good, two types of ear.

85. Golden Dent. (B P. Mann.) Fair sample; ears not uniform and are tapering; rows are irregular; kernel evenly dented and rough; furrow slight; pale orange; cob red; crop fair, two types of ear; cross-fertilization evident.

86. Ill. Premium Dent. (Vaughan.) Only fair sample; fairly well filled; not of even type; kernels on some broad, evenly dented, slightly rough; on others more rectangular, and not so evenly dented; furrow deep on some, and almost absent in others; light orange and orange; cob red; crop, very fair sample and quite even; traces of cross fertilization.

It should, through all these notes, be borne in mind that the seed was taken from one good ear.

87. Smith's Improved. (Nathan Smith) Fair sample; quite uniform and even diameters; rows slightly irregular; kernels broad, evenly dented; furrow very slight; orange; cob red; crop fair; type true; traces of cross-fertilization.

88. Thompson's Corn. (Lafayette Thompson.) Only fair sample; tips defective; a little uneven in surface; rows irregular; kernels quite even, rough; furrows slight; pale orange; cob light red; crop good; true to type; traces of cross-fertilization.

89. McCoy Corn. (M. H. McCoy.) A very fair sample; tapering slightly, well filled at points; even, regular rows; kernels flat, evenly dented; slightly rough; furrow almost wanting; orange; cob red; two types; traces of cross fertilization.

90. Shively. (G. P. Lozer.) A fair sample; diameters quite uniform; points well filled; rows regular; kernels flat, unevenly dented; little rough; furrow slight; pale orange; cob red; crop fair; two types; traces of cross-fertilization.

91. Golden Beauty. (E. R. Walker.) Previously described at 75. This was a smaller sample of same type. It was much advertised, but is apparently unworthy of cultivation.

92. Bounds. (J. M. Allen.) Fair sample; butt heavy; well filled; rows little uneven; kernels evenly dented, slightly rough; furrow slight; bright orange; cob red; crop good; two types; traces of cross-fertilization.

93. Improved Clarage. (Wm. Henderson.) A very fair sample, even, well filled; rows regular; kernels evenly dented; quite rough; furrow slight; pale orange; cob red; crop good; three types of ears; cross-fertilization evident.

94. Willison's Yellow. (Wm. Willison.) Only fair; tapers decidedly; rows regular; kernels unevenly dented and rough; furrow well marked; bright orange and deeper below; cob white; crop fair; three types of ear; cross-fertilization evident.

95. White Cap. (E. A. Prior.) A very fair specimen; tapers a little too much, but is well filled; rows even; kernels evenly dented, slightly rough; furrow wanting; white, or nearly so, orange below; cob red; crop good; true type; cross-fertilization evident.

96. Clarage. (Livingston.) Good sample; well filled at points; even diameters; rows somewhat irregular; kernels flat, unevenly dented; some rough, others smooth; furrow slight; pale orange; cob red; crop very fair; two types of ear; traces of cross fertilization.

97. Small Dent. (E. A. Prior.) Fair; tapers decidedly, but close, well filled; rows irregular; kernels unevenly dented; slightly rough; orange; cob red; crop good; true to type; cross-fertilization evident.

98. Calico. (A. E. Smith.) Sample shelled, and no notes made; crop good; several types of ear represented.

99. Hiawassee. (W. H. Woodworth.) Sample shelled; crop a large White Dent; very fair and true type; cross-fertilization evident.

100. Mammoth White Surprise. (Henderson.) Heavy club looking ears, not well filled at points; rows even; kernels flat, many imperfect; furrows slight; pale white; cob white; crop very fair; true to type, and apparently pure. The crop is much superior to seed.

101. Boone Co. White. (James Riley.) Fair; heavy butts, defective tips; even rows; kernels short, evenly dented, smooth; furrow well marked; pale white; cob white; crop fair; two types; cross-fertilization evident.

102. Watkin's White. (F. M. Watkins) A good sample; quite even; well filled at points; rows regular; kernels flat, unevenly dented, both rough and smooth; furrows slight; pale white; cob white; crop good; two types; cross-fertilization evident.

103. Hampden's Prolific. (B. L. Bragg & Co.) Only fair; very large butts and tapers decidedly; rows regular; kernels evenly dented; furrow very deep; white; cob red; crop better than sample; true to type, but shows effect of foreign pollen.

104. Union Co. White. (W. M. Woodworth.) Fair sample; quite uniform and well filled; rows regular; kernels evenly dented and rough; pale white; cob white; crop good; on type; evidences of cross-fertilization.

105. Number One. (Seth R. Henchett.) A fine, smooth sample; little defective at tip; rows even; kernels evenly dented; furrow slight; pale white; cob red; crop good; on type; traces of cross-fertilization.

106. Horse Tooth. (A. H. Lindsay.) Fair sample, tapering moderately; rows fairly regular, distinctly set in pairs; kernels flat, evenly dented; furrow deep; pale white; cob white; crop poor, loose stuff; two types.

107. Champion White Pearl. (Livingston.) Fair sample; well filled; rows regular; kernel flat, evenly dented, some rough; furrow slight; pale white; cob white; crop fair; quite true to type; cross-fertilization evident.

108. Beard's White Pearl. (Livingston.) Only fair sample; tapers considerably; faulty at tip; rows even; kernels both flat and rectangular; not evenly dented, some rough; others smooth; furrow slight; pale white; cob white; crop quite good; true type; traces of cross-fertilization.

109. Pedan's White. (D. G. & J. H. Pedan.) Fair sample; very closely filled; rows irregular; kernels unevenly dented and rough; furrow wanting; white; cob pale strawberry; crop good on type; badly mixed with yellow kernels.

110. Early Dawn. (Livingston.) Very fair sample; well filled at points; rows regular; kernels rectangular, evenly dented and smooth; furrow almost wanting; pale white; cob red; crop good; on type, but badly mixed.

Some mixed dents are here omitted, and also some of the white and yellow classes, because sample was shelled, and the crop does not furnish a standard type to describe.

We mention that several varieties of the soft race were grown here this season. But do not consider them of any promise for this latitude. In fact, they are of very doubtful value when compared with the Dent race, even if they could be well grown. The Clark's Flour corn is especially mentioned; none of this variety matured here after having an exceptionally long season.

Also a dozen varieties of Mexican corn were planted. They made enormous growth, some reaching a height of 16 and 18 feet, and were just nicely tasseling when frost put a stop to their growing.

The preceding notes on varieties are of doubtful value, but are given as a part of our study, and to the student of the question may be in a measure useful.

The fact that the Dent varieties produced scarcely any samples pure is worthy of note. Whether these samples had previously been exposed to foreign pollen, we have no means of knowing, but it is very evident that purity of breeding and type is almost unknown among the Dent varieties. With the Flints it is some better.

PLANTING AT DIFFERENT DEPTHS AND DIFFERENT DATES.

This work presents two questions, one as to depth and the other as to date of planting. Previous tests have shown conclusively that the question of depth for ordinary soil and season lies between one and four inches, with the evidence tending to favor the shallow planting.

The question of date has not been as thoroughly tested in our work as depth, but the indications are that it is quite as important. The Station hopes in the future to put the inquiry on a better basis, supplementing the work by careful reading of soil thermometers, as well as observations above ground on temperature and rainfall.

While it is duly recognized that atmospheric conditions are not the same on similar dates for different years, yet a study which deals with their absolute condition and its effect upon plant growth are just as important as though the seasons obeyed fixed law.

The following table presents the yields of this year's work as weighed from the field, also corrected yields, and facts relating to development of ear, time of ripening, etc.:

TABLE III.—PLANTING AT DIFFERENT DEPTHS.

Depth of planting.	Planted April 28, 1885.				Planted May 5, 1885.				Planted May 13, 1885.			
	Bushel corn as weighed from field.	Per cent. of ears.	Per cent. of nubbins.	Yield corrected to perfect stand.	Bushel corn as weighed from field.	Per cent. of ears.	Per cent. of nubbins.	Yield corrected to perfect stand.	Bushel corn as weighed from field.	Per cent. of ears.	Per cent. of nubbins.	Yield corrected to perfect stand.
One inch......	61.5	73	27	**66.4**	55.2	67	33	**56.6**	93.0	94	6	**94.5**
Two inches...	54.6	73	27	**60.3**	49.8	55	45	**54.8**	76.2	78	22	**79.3**
Three inches	54 9	77	23	**60.7**	50.8	61	39	**53.6**	71.8	75	25	**73.2**
Four inches..	....	......	......	....	....	......	......	....	63.5	77	23	**67.6**

Depth of planting.	Yield of stalks per acre.	Stalks to 100 lbs. of corn.	Time of ripening.	Yield of stalks per acre.	Stalks to 100 lbs. of corn.	Time of ripening.	Yield of stalks per acre.	Stalks to 100 lbs. of corn.	Time of ripening.
	Lbs.			*Lbs.*			*Lbs.*		
One inch......	3320	80	Sept. 1	3237	80	Sept. 1	4924	80	Sept. 6
Two inches...	2508	70	1	2371	70	1	4268	80	6
Three inches	2726	72	1	2307	64	1	2736	54	6
Four inches..	....	......	....	....	......	....	3283	73	6

The important features of the above will be best brought out by giving a comparative table, in which will be included the work for three years. As to date of ripening, early planting did not make a difference corresponding with time of planting. These earlier plots made a fairly vigorous growth, and promised better results than the table shows. The first planting was nineteen days coming through the ground, during which time the temperature averaged 54.2° Fah., and the rainfall was 1.6 inches. The second planting was fifteen days vegetating, average temperature was 56.1°, and precipitation was .83 of an inch. The third planting vegetated in eight days, average temperature 65.2°, precipitation .13 of an inch. On May 25th the plots did not show much difference in appearance.

In the following comparative table for depths and dates of the years 1883, 1884, and 1885, the depths vary from one to three inches.

COMPARATIVE TABLE.

Year.	Average of plantings at different dates—plots up to three inches deep.						Av. of plantings at different depths—up to 3 inches.		
	First planting.		Second planting.		Third planting.		1 inch.	2 inches.	3 inches.
	Date.	Yield.	Date.	Yield.	Date.	Yield.			
1883	May 26	67.8	June 2	67.4	June 9	62.6	86.3	60.8	50.7
1884	May 22	44.1	May 29	36.5	June 5	35.4	36.9	37.4	41.6
1885	April 28	62.1	May 5	55.0	May 13	82.5	72.5	64.8	62.5

As to the best time for planting, it is difficult to draw conclusions from the above table, for dates represent no fixed character of seasons whatever; but let us examine the results at different dates with the character of seasons accompanying each.

For 1883, the planting began late; in fact, after corn usually should be planted in this section, and the study kept in view was depths not dates; however, the results are just as valuable for this comparison.

The character of the spring of 1883 was such that ground could not have been well fitted for planting earlier. The planting was at three dates, with intervals of one week between.

The yields for first and second planting are practically the same, and but slightly in excess of the yield of third planting. The weather, during period of first and second planting, was such as not to promote rapid growth, as the rainfall was excessive, thereby lowering the temperature in the evaporation of moisture. The records of the three plantings plainly show that nothing was gained by planting on May 26th. The planting of June 9th evidently was too late. This is shown more in the soft corn than in total yields.

The planting for 1884 was also begun late, as we were looking more to depths than time of planting.

The weather in relation to the results was as follows: May, a rather cold month, and the rainfall quite abundant, with a cold wave at the close of the month, during which white frost was observed in several places. From the first of June until in September a most severe drouth prevailed. This was very detrimental to late planting, as it did not get rooted before the soil was very dry.

For this year the best yield is decidedly with the earliest planting, and it is to be regretted that some plots were not planted much earlier to better observe the effects of the drouth.

The spring of 1885 was quite favorable to early planting, and, desiring to extend the work in this regard, the first plot was planted April 28th. The ground was in very good shape for this early planting, and also for subsequent plantings. The notes previously given show the character of the weather during the early period of growth of the plots for this season. Plot one remained nineteen days before vegetation; plot two, fifteen days; plot three, eight days. A marked difference, indeed, and the result is plainly evident in the yield, as given in first table of this series.

The difference of yield here is so marked that it affords ground for argument, being over 20 bushels greater than best yield of other plots. The soil for this series is quite even, and we had reason to suppose was better, if anything, with the earlier plantings. We interpret these results to show that early planting, if followed by cold, wet weather, is very detrimental to the crop; much more so than is generally supposed. Certainly, too late planting should be avoided, but in these days of rapid work with horse tools it would be a paying operation to put extra time on the preparation of soil and defer planting until the season is propitious. With the proper attention paid to selecting varieties, we are certain that the corn season can be brought within one hundred and ten days, and if so, the evidence is against rather than for planting before the 20th of May in this latitude.

A fourth series of plots was planted later than last series given in table, but outside influences rendered their results valueless, except the one and two-inch plots. These showed a yield of 90.5 bushels and 83.3 bushels, respectively. They were planted May 19th. This lends additional force to our argument. These yields were not used in any of the averages.

Next we consider the question of depths. The last three columns in the table of averages give the results quite clearly. These averages are obtained from the plantings at the same depth for the several periods of each year. The general result is unquestionably in favor of shallow planting. To this, however, we notice the quite strong exception of three inches deep for 1884, but the peculiarities of this year have already been given. This difference is undoubtedly due to the drouth which prevailed during that season. If these results are now considered sufficient to sustain an argument, it would be decidedly in favor of shallow planting.

In the first table of this series, which gives the yields of this year, no soft corn is noted. The year was so favorable that all was well matured. The nubbins, however, might be considered unmerchantable grain.

THICK AND THIN SEEDING.

This work is a continuation of previous investigations. The general plan is the same as in former years, though the distances are altered somewhat to suit our study of the question. The two general propositions before laid down constitnte the basis of the inquiry. These are: (1.) What area is required to each plant for the best results? and (2) allowing a given area for each plant is it better to group them or place each one separately? The inquiry is based entirely upon product of merchantable corn. The custom of farmers is varied, some maintaining that one practice is better and some another. If this inquiry teaches anything, it is of general application only, being necessary to interpret the mean results according to local conditions of stronger or weaker growth of stalk. The maximum yield of merchantable corn is at no time obtained with that plot which shows the maximum gross yield. This is is an important point to those growing corn for feeding purposes, as the distance at which the greater amount of valuable fodder corn can be grown is very often wrongly stated.

The following table gives the complete results for this year. An analysis of this in comparison with work of former years follows.

The rows are all 3½ feet apart, plots planted May 16th, distances gauged by tape line:

Plot.	How planted.	Yield as weighed from field.	Yield corrected to full stand.	Weight of stalks, pounds.	Stalks to 100 pounds corn.	Corn to each stalk, pound.	Per cent. of ears.	Per cent. of nubbins.
1	One kernel 6 inches apart............	68 3	70.6	4,435	188	.21	27	73
2	" 12 "	79.5	83.7	3,040	122	.55	71	29
3	" 18 "	70.6	71.7	2,584	111	.67	85	15
4	" 24 "	59.6	62.7	1,976	98	.70	83	17
5	Two kernels 12 inches apart.........	78.2	80.3	4,286	170	.22	39	61
6	" 24 "	100.4	105.6	2,584	80	.60	73	27
7	" 48 "	59.5	62.0	2,280	112	.70	82	18
8	Three kernels 18 "	85.6	88.0	3,496	123	.24	43	57
9	" 36 "	79 4	83.2	2,280	85	.45	68	32
10	" 54 "	71.1	74.3	1,724	77	.62	74	27

Before proceeding to the discussion of the previously mentioned conditions, attention is called to the fact that all plots were of nearly perfect stand, as is shown by the slight increase of corrected yield over actual yield. This is a strong point in favor of accepting the results as reliable. None of the plots showed soft corn. All ripened fairly even, and were marked ripe September 6th. Throughout there was an exactness and uniformity in the work and results which greatly enhances its value in regard to the special points to be illustrated.

The examination as to area on which one plant will produce best results, is taken up first.

The plots which for three years have produced best yields of *ears* are here arranged:

Year.	How planted.	Yield.	Per cent. ears.	Per cent. nubbins.
1883	One kernel 18 inches apart..	92.4	70.	30.
1884	" 24 "	41.6	85.	15.
1885	" 18 "	71.7	85.	15.

These plots are not those, in any case, which have produced the greatest yield, and, in some instances, do not show greatest development of ear, but are those in which the two points combined produce greatest yield of ear corn.

The average distance of these plots is 20 inches; for the years 1883 and 1885, the distance is the same, 18 inches, but the season when the extreme drouth prevailed, the distance is increased to 24 inches. For the reason that all results for 1884 are not normal we will omit it from the average hereafter, though giving it in all of the comparative tables. This would leave the average distance of best results, for marketable corn, 18 inches, and the average yields from these plots 82.1 bushels.

Now, we introduce for comparison with these results those plots of one kernel series for the several years which have produced greatest yield irrespective of development of ear:

Year.	How planted.	Yield, bushels.	Per cent., ears.	Per cent., nubbins.	Excess of yield over previous table.
1883	One kernel 9 inches apart	106.9	34	66	14.5
1884	" 18 "	43.0	63	37	1.4
1885	" 12 "	83.7	71	29	12.0

Omitting 1884, the average of distance is 10½ inches, and of yield is 95.3 bushels; the average excess in yield of this table over previous is 18.2 bushels. Between the distances 10½ and 18 inches there doubtless lies the mean of distance for best development of crop in regard to ear, with the indications that it lies nearer the greater distance. Especially is this true if we allow the results for the year of drouth to affect the conclusions. It is very evident that any lack of moisture increases the mean of distance.

As to whether we are to interpret these results as meaning that each stalk of corn requires, say, 15 inches by 3½ feet for its best development, or whether it is at all times necessary to maintain this distance for the free admission of light and sunshine is uncertain. If it is important to have quite considerable interspaces between plants, and the results point in this direction, cannot this be best accomplished by grouping. Two or three stalks in a hill, at a slightly increased distance, more freely admits air and sunshine, and the roots will fully occupy the ground, say at a distance of 24 inches. The increased shading of the ground by this increase in number of stalks is not to be compared with the shade they would cast if distributed along the space.

The argument is made to present the evidence pro and con, not to give opinions.

We will now examine the two series of grouping kernels as to the evidence they present.

The plot producing best yield of ear corn is taken from both the two and three kernel series, for the three years:

Year.	How planted	Yield.	Per cent. of ears.	Per cent. of nubbins.
1883	Two kernels 24 inches apart	88.7	55	45
"	Three " 36 "	90.0	68	32
1884	Two kernels 30 inches apart	37.0	50	50
"	Three " 30 "	31.3	20	80
1885	Two kernels 24 inches apart	105.6	73	27
"	Three " 36 "	83.2	68	32

The record for plots of 1884 are even more at variance with normal yields in this table than in those previously given. This furnishes additional proof of the correctness of leaving them out of an average which may be interpreted as giving a general law. This year was so exceptional that averaged with so few ordinary years it makes the result unintelligible; whereas, in a long series of years it doubtless should be averaged. This is not to say that the results of that year are valueless, for any accurately kept record has its value, and the teaching of that year is doubtless very valuable as showing probable results from deficiency of moisture. Especial attention is called to the fact that in no instance does the grouping system develop as great a per cent. of ears as the one kernel system does.

It is also quite an important fact that the best results for both series for the years 1883 and 1885 are at identical distances This tallies with results from one kernel planting. Hence, the average of best results for two kernels gives 24 inches as the distance, and for three kernels 36 inches as the proper distance. The averages of yields are, two kernel series 97.1 bushels; three kernel series 86 6 bushels.

The following table gives the best absolute yields from the same two series of plantings, and for same years:

Year.	How planted.	Yield.	Per cent., ears.	Per cent., nubbins.	Excess in yield over previous table.
1883	Two kernels 15 inches apart	114 2	34	66	25.5
"	Three " 36 "	90.0	68	32	00.0
1884	Two kernels 27 inches apart	40.3	40	60	3.3
"	Three " 30 "	31.3	20	80	00.0
1885	Two kernels 24 inches apart	105.6	73	27	00.0
"	Three " 18 "	88.0	43	57	4.5

The first thing we notice in the above table is that the best absolute yield is, in several cases, the same as best yield of ear corn. Which argues very well for grouping. This is the case for 1883, three kernels 36 inches; 1884, three kernels 30 inches; 1885, two kernels 24 inches. The averages of absolute best yields are for two kernels series, 109.9 bushels; for three kernels series, 89.0 bushels. The average of distance at which they were produced is for two kernel series, 19½ inches; for three kernel series, 27 inches. It should be noted that distances for best absolute yields have not that uniformity noted in best yield of ear corn. We now collect the average obtained from the several comparisons:

Series.	Average yield, bushels.	Average distance, inches.	Average per cent., ears.	Average per cent., nubbins.
One kernel series, best development of ears	82.1	18	77.5	22.5
One kernel series, best absolute yield	95.3	10½	52.5	47.5
Two kernel series, best development of ears	97.1	24	64.0	36 0
Two kernel series, best absolute yield	109 9	19½	53.5	46.5
Three kernel series, best development of ear	86.6	36	68.0	32.0
Three kernel series, best absolute yield	89.0	27	55.5	44 5

The indication of the above comparisons are not to be considered absolute, only relative, but from them there is certainly an important lesson to be drawn, if future work corroborates these results.

First, the best yield of ear corn is found at two kernels, 24 inches apart.

Second, the best yield, regardless of development ear, is found at two kernels, 19½ inches apart.

Third, the least crop of ear corn is with one kernel, 18 inches apart, yet this shows decidedly the highest per cent of ear development. It is rather remarkable that this plot planted with but two-thirds, the seed of best plot should show a yield only about 15 per cent. less.

This result might be taken as in part answering a former suggestion, that it is advantageous to group the kernels; extra cost of seed is to slight a factor for consideration.

A certain distance between hills is absolutely necessary to best development, and a certain grouping seems to add to the possibilities of maximum crop.

Fourth, the maximum crop, both of ear corn and absolute yield, are found in two kernel series, indicate that grouping can be carried to but a certain limit with success. Other suggestions and comparisons might be drawn from the table.

METHODS OF CULTURE.

The plots were all one-sixteenth acre each, and planted three and one-half feet each way, May 16th. All were prepared in the same manner, and the plants on all came through very evenly. The cultivation was with Planet, Jr., horse hose, unless otherwise specified. This implement is a fairly successful tool for shallow cultivation, which we consider the true method of cultivating corn.

The table presented below is an addition to former experiments in this line, which was suggested by Mr. H. Underwood, of Paulding County, this State, and we gladly acted on his suggestion. The design is to note the effect of giving to the crop all the cultivation it receives in the early stages of growth, and of extending the same cultivation over a considerable portion of the season.

Plot.	How cultivated.	Yield of corn from field.	Yield corrected to perfect stand.	Yield of stalks.	Per cent. of ears.	Per cent. of nubbins.
		Bu.	*Bu.*	*Lbs.*		
1	Four times, at ordinary intervals	84.5	87.7	4,620	82	18
2	Three times, at intervals of two days	85.0	89.5	4,466	81	19
3	Three times, at intervals of four days	69.0	78.1	3,234	75	25
4	Three times, at intervals of eight days	61.8	81.0	2,772	69	31
5	Three times, at intervals of twelve days	80.5	94.0	4,158	86	14
6	Four times, ordinary	80.8	86.3	3,757	85	15

In the above table, as in all previous work, comparisons are based on yield corrected to perfect stand.

The comparison shows nothing except that the yields are remarkably uniform for single plots, and the work shows no difference sufficient to base an argument upon. The two ordinary treated plots, Nos. 1 and 6, are remarkably even, and with the other yields indicate uniformity of conditions.

Plot No. 2 was laid by June 15th, three weeks before ordinary plots were, and yet it seems not to have suffered in yield by so doing. The question might resolve itself into this, as to whether ordinarily corn is not cultivated too much so far as profit is concerned, and, considered in that light, it favors, if anything, views advanced in previous reports: that the limit of profitable cultivation is below what farmers ordinarily believe it to be. The rest of the work in methods of culture follows here, and we wish to state that the soil for this work, as well as for all other corn work, was most thoroughly prepared with Acme harrow and roller. The ground was plowed seven to eight inches deep, in the spring.

Plot.	How treated.	Yield of corn from field.	Yield corrected to perfect stand.	Weight of stalks.	Per cent. of ears.	Per cent. of nubbins.
		Bu.	*Bu.*	*Lbs.*		
1	Cultivated four times, ordinary	80.8	86.3	3,757	85	15
2	Not cultivated at all	7.9	8.8	1,556	9	91
3	Surface cultivation	68.9	91.3	3,080	78	22
4	Cultivated four times, ordinary	71.9	93.5	3,203	79	21
5	Cultivated excessively	74.1	88.4	3,800	75	25
6	Not cultivated at all, drain beneath center of plot	3.5	4.1	1,201	6	94
	Cultivated four times, ordinary; drain beneath the center of plot	84.4	96.4	4,004	85	15
	Cultivated ordinary, drain in plot on either side	84.7	102.3	4,004	88	12
	Ordinary, drain beneath plot	90.3	102.9	4,620	85	15
10	Cultivated excessively	79.9	88.3	4,800	81	19

This table and previous one formed one consecutive series of plots, and plot 1 of this table is the same as plot 6 of the previous.

Comparing by corrected yields and omitting plots uncultivated, here again is found marked uniformity of results. Plots six, eight, and nine show the best yields. This might be attributed to the tile drainage.

Their average is 100.5 bushels per acre, and the average of other plots is 89 6 bushels per acre. The yields from uncultivated plots is too small to be noticed. The first uncultivated plot was under ordinary treatment last season, and yielded as well as other plots.

The second uncultivated plot, No. 6, has been so treated for three years. This plot has a drain beneath it the same as No. 7. The growth of weeds on both uncultivated plots was very abundant.

It should be noticed that surface cultivated plot is above the average of undrained plots. The work on this plot was done with a light small tooth harrow.

Plots five and ten were to have been cultivated excessively with shovel-plow, considerably deeper than ordinary cultivation, but storms bent the stalks down so it was impossible to carry out the plan without doing injury aside from deep late cultivation. They received one cultivation after the ordinary work had been laid by. This was about the time of fully coming into tassel. These two plots are among the lowest yields; however, there is not difference enough for an argument.

If extending the cultivation late into the season, as many farmers do, is of no value, it is important to know it; conversely, if thorough preparation of the soil and cultivation of the young plant produces as good crop as more extended cultivation, it is an important fact; also, if light shallow cultivation of the surface produces as good crop as heavy deep cultivation, it is important that the farmer should know this.

The abundance of moisture during the past season made observations on the ability of cultivated soil to withstand drouth of little importance.

For the years 1883 and 1884 the best yields were from plots cultivated twice.

We state here that this soil was cropped for four years successively without manure. Last spring a good coat of manure, about twelve tons per acre, was plowed under.

Ridge culture was an entire failure the past season. We think that the extra labor involved with this method of planting entirely overcomes any theoretical advantage which may be claimed for it, and, further, from experience here, it is absolutely impracticable with any implements yet tried.

APPLICATION OF FERTILIZERS.

The fertilizer work is altered in some particulars from previous years' tests, but is on the same general plan.

Explanatory remarks about the size and conditions of the plots have been given in previous reports, but are here repeated in part. The plots are one-sixteenth acre each, being about sixteen rods long and ten and one-half feet wide. This allows three rows three and one half feet wide to each plot. The distance between plots is seven feet The field is not exactly square, hence the shape of plots has to conform to it and are as given above. This size of plot gives as nearly conditions of field work as plot experiments can be. The plowing is done crosswise, and due care is observed not to displace the soil from the plots. The division of the field where this work is conducted, embracing nearly four acres, has received no fertilizers, except those specially applied and noted in the tables, since 1881. The work the past season was accomplished under exceptionally good conditions.

The proper interpretation of plot experiments is a matter of much difficulty, and the object sought is to present as many facts as possible, leaving the theorizing and summing up for the future, when our absolute knowledge of the subjects should be more complete.

It is evident that differences noted between two plots for one year teach but little, and that all results of value must be averages of duplicate plots, for the same year and for different years. All opinion about the matter, unless subjected to the most rigorous test as to matters of fact, is of no avail.

Appearances are especially deceiving where fertilizers are used, and only facts obtained by careful weighings and examinations are to be relied upon.

The following table presents the record of the plots for this year: —

Plot.	Kind of fertilizer.	Yield of corn as weighed from field.	Yield corrected to perfect stand.	Yield of stalks.	Stalks to 100 lbs. of corn.	Per cent. of ears.	Per cent. of nubbins.
		Bu.	*Bu.*	*Lbs.*	*Lbs.*		
1	Nitrate Soda	82.8	85.9	3,952	70	85	15
2	"	78.5	81.7	4,104	75	79	21
*3	Unfertilized	90.1	92.6	3,897	64	82	18
4	Muriate Potash	85.0	87.4	4,560	80	75	25
5	"	84 2	88.0	4,651	80	79	21
*6	Unfertilized	80.8	84.2	3,800	70	77	23
7	High grade Superphosphate	75.6	76.7	3,640	70	92	8
8	" "	74.7	76 7	3,891	75	60	31
9	" "	77.1	79.4	3,800	70	72	28
†10	Unfertilized	77.4	80.1	3,253	60	76	24
11	Sulphate of Ammonia	78.8	82.6	3,800	68	74	26
12	" "	75.7	78.9	3,715	70	78	22
‡13	Unfertilized	79.4	82.4	3,493	63	80	20
14	Nitrate Soda in hill	78.4	82.9	3,890	71	79	21
15	Muriate Potash in hill	88.5	104.2	4.964	80	85	15
‡16	Unfertilized	93.5	103.7	4,979	80	84	16
17	Sulphate of Ammonia in hill	72.9	88.3	3,800	75	77	23
‡18	Unfertilized	96.8	103.1	4,955	73	85	15
†19	"	89.0	101.6	3,499	72	85	15
20	Hen manure	88.8	99.4	4,773	77	78	22
21	Compost	89.7	105.9	5,016	80	89	11
22	Horse manure, fresh	97.5	104.0	5,320	77	86	14
23	Special manure	80 2	86.5	5,928	106	78	22
24	"	83.5	97.7	5,168	90	86	14
‡25	Unfertilized	88.5	96.6	5,168	83	83	17
†26	"	80.2	85.9	3,952	70	68	32
27	Guano in hill	74.6	91.0	4,408	84	77	23
28	Guano broadcast	79.5	97.8	4,621	83	63	37
‡29	Unfertilized	74.8	85 9	3,952	75	73	27
30	Salt	69.2	84.7	3,648	75	68	32
*31	Unfertilized	75.1	86.2	3,800	72	70	30
32	Wood-ashes	84.0	94.8	3,648	62	75	25
33	Tobacco stems	81.6	96.3	3,738	65	78	22

* Unfertilized for two years past.

† Unfertilized for whole time of experimentation.

‡ Unfertilized for one year past.

The above table offers no grounds for comparison. The yields are exceptionally uniform. Had it been our intention to produce duplicates, we doubt if this record could have been excelled.

Particular attention is called to the fact that corrected yields but slightly exceed actual yields, showing that the stand was nearly perfect. The exceptions noted to this is where concentrated fertilizers were used in the hill and also guano and salt broadcast. We are quite thoroughly convinced that fertilizers should be applied broadcast.

During the summer, plots treated with high grade superphosphate and special corn manure gave promise of better crops than others, and all fertilized plots promised better results than the unfertilized, but the weights of corn showed this to be delusive. The fertilized plots show almost uniformly a greater weight of stalks than the unfertilized.

If these applications after being tested thus carefully, show no benefit worthy of notice, is it not best that the farmer should invest carefully in high priced special manures for corn? Special manures are not condemned, because it is well known that under some conditions they are beneficial. It is more than probable, however, that much money is thrown away upon them.

The failure to produce satisfactory results from the use in good form of what is known to be the essential elements of fertility will only induce all interested to prosecute the work with more care.

We wish to further add here that the fall of 1881 and previously this land had been bountifully treated with stable manure, much of the fertility of which doubtless yet remains in the soil; and that the application of the fertilizers during the past three years has, without doubt, added somewhat to this fertility. The general crop for 1885 was considerable better than 1883. And added to other things, the high tillage that it has had during these trials has put it in condition to produce a maximum crop.

The following table gives a complete summary of the kinds and amounts of the different fertilizers used for the past three years, and a summary of the yields. It is worthy of careful study:

SUMMARY OF THE KINDS AND AMOUNTS OF FERTILIZERS USED.

Plot.	Treatment of each plot for two years previous to 1885.	Treatment for 1885.	Accumulated quantity of fertilizers during 3 y'rs.	Remarks.	Yields for three years, corrected to perfect stand.		
					1883.	1884.	1885.
1	Nitrate of soda, 300 lbs. in hill each year	Nit. of soda, 300 lbs. broadcast	Nit. soda, 900 lbs	Applied consecutively during the the three years	69.4	23.7	85.9
2	Same, 300 lbs. broadcast each year	Same, 600 lbs., broadcast	Nit. soda, 1200 lbs	Applied during the three years; one-half the last year	68.0	29.1	81.7
3	Same, 600 lbs. broadcast in 1883; unfertilized in 1884	Unfertilized	Nit. soda, 600 lbs	All applied the first year	66.7	28.9	92.6
4	Muriate of potash, 300 lbs. in hill each year	Muriate of potash, 300 lbs. broadcast	Mur. pot., 900 lbs	Applied consecutively during the three years	67.1	20.4	87.4
5	Same, 300 lbs. broadcast each year	Same, 600 lbs. broadcast	Mur. pot.. 1200 lbs	Applied during the three years; half the last year	68.4	30.9	88.0
6	Same, 600 lbs. broadcast in 1883; unfertilized in 1884	Unfertilized	Mur. pot., 600 lbs	All applied the first year	67.9	28.1	84.2
7	South Carolina rock phosphate, 200 lbs. in hill each year	High grade superposphate, 200 lbs. broadcast	S. C. rock, 400 lbs H. G. superphos., 600 lbs	First item applied first two years, and second the last year	66.1	24.3	76.7
8	Same, 200 lbs. broadcast each year	Same, 600 lbs. broadcast	S. C. rock, 400 lbs H. G. superpos., 600 lbs	As previous	65.3	21.4	76.7
9	Same, 400 lbs. broadcast each year	Same, 800 lbs. broadcast	S. C. rock, 800 lbs H. G. superphos., 800 lbs	As previous	66.7	26.0	79.4
10	Unfertilized both years	Unfertilized		Has received no fertilizer since 1881	41.3	28.1	80.1
11	Sul. of ammonia, 200 lbs. in hill each year	Sulphate, ammonia, 200 lbs. broadcast	Sul. am., 600 lbs	Applied during the three years	52.6	21.4	82.6
12	Same, 200 lbs. broadcast each year	Same, 400 lbs. broadcast	Sul. am., 800 lbs	As previous, one-half am't last year	50.7	33.4	78.9
13	Same, 400 lbs. broadcast each year	Unfertilized	Sul. am., 800 lbs	Applied during first two years	42.8	24.7	82.4
14	S. C. rock, 200 lbs Nitrate of soda, 300 lbs. Broadcast each y'r	Nitrate soda, 300 lbs. in hill	S. C. rock, 400 lbs. Nit. soda, 900 lbs	Applied during the three years; S. C. rock omitted last year	58.3	32.8	82.9
15	S. C. rock, 200 lbs Muriat of potash, 300 lbs Broadcast each y'r	Mur. of pot., 300 lbs in hill	S. C. rock, 400 lbs. Mur. pot., 900 lbs.	As previous	75.0	39.4	104.2
16	Muriate of potash, 300 lbs. broadcast e'h y'r Nitrate soda, 300 lbs. in 1883; 200 lbs. in 1884; broadcast each year	Unfertilized	Mur. pot., 600 lbs. Nit. soda, 500 lbs.	Applied during first two years	62.8	35.8	103.7
17	S. C. rock, 200 lbs Sul. ammonia, 200 lbs Broadcast each year	Sul. amm. 200 lbs. in hill.	S C. rock, 400 lbs. Sul. am., 600 lbs.	Applied during the three years; S. C. rock omitted last year	63.5	33.7	88.8

SUMMARY OF THE KINDS AND AMOUNTS OF FERTILIZERS USED.

Plot.	Treatment of each plot for two years previous to 1885.	Treatment for 1885.	Accumulated quantity of fertilizers during 3 y'rs.	Remarks.	Yields for three years, corrected to perfect stand.		
					1883.	1884.	1885.
18	Same as above, with 300 lbs. muriate of potash added, broadcast each year	Unfertilized	S. C. rock, 400 lbs. Sul am., 400 lbs. Mur. pot., 600 lbs.	Applied during first two years	73.5	35.1	103.1
19	Unfertilized both years	Unfertilized		Same as No. 10	72.1	43.7	101.6
20	S. C. rock, 200 lbs. Sul. of ammonia, 200 lbs Mur. of potash, 300 lbs. Nitrate of soda, 300 lbs. All b'dc't for '83; unfert'zed for'84	Hen manure, 3 tons br'dc't	S. C. rock, 200 lbs. Sul am., 200 lbs. Mur. pot., 300 lbs. Nit. soda, 300 lbs. Hen manure, 3 tons	Minerals applied in 1883; nothing in 1884; manure in 1885	72.3	42.9	99.4
21	One-half of above each year, broadcast	Composted horse manure, 16 tons broadcast	S. C. rock, 200 lbs. Sul. am., 200 lbs. Mur. pot., 300 lbs. Nit. soda, 300 lbs. Horse manure, 16 tons comp'ted.	Minerals applied during first two years; manure for 1885	73.7	56.7	105.9
22	One-third of No. 20 for 1883, and one-fourth for 1884, broadcast	Fresh horse manure, 16 tons broadcast	S. C. rock, 116 lbs. Sul. am, 116 lbs. Mur. pot., 175 lbs. Nit. soda, 175 lbs. Horse manure, 16 tons fresh	As previous	79.2	54.3	104.1
23	Special corn manure, 300 lbs., in hill both years	Special corn manure, 300 lbs., in hill	Special manure, 900 lbs.	Applied during the three years	92.6	53.5	86.5
24	Same, 300 lbs., broadcast both years	Same, 600 lbs, broadcast	Special manure, 1,200 lbs	Applied during three years, one-half last year	87.3	55.3	97.7
25	Same, 600 lbs., " "	Unfertilized	Special manure, 1,200 lbs	Applied during first two years	93.0	60.1	96.6
26	Unfertilized both years	"		Same as No. 10	104.4	54.4	85.9
27	Gypsum, 500 lbs., in hill	Guano, 200 lbs., in hill	Gypsum, 1,000 lbs. Guano, 200 lbs.	Gypsum first two years, guano last year	98.8	54.9	91.0
28	Same, 500 lbs., broadcast	Same, 400 lbs., broadcast	Gypsum, 1,000 lbs. Guano, 400 lbs.	As previous	84.0	51.7	97.8
29	Same, 1,000 lbs., broadcast	Unfertilized	Gypsum 2,000 lbs.	Applied during first two years	67.4	44.5	85.9

30	Lime, 50 bushels, in hill for 1883; agl. salt, 500 lbs., broadcast for 1884	Agricultural salt, 500 lbs., broadcast	Lime, 50 bush. Agricultural salt, 1,000 lbs.	Lime first year, salt last two years	72.8	42.8	84.7
31	Lime, 50 bushels, broadcast for 1883; unfertilized for 1884	Unfertilized	Lime, 50 bushels	Applied first year	75.2	44.8	86.2
32	Wood ashes, 40 bushels, in hill both years	Wood ashes, 50 bushels, broadcast	Wood ashes, 130 bushels	Applied during the three years	72.2	82.9	94.8
33	Same, 40 bushels, broadcast both years	Ground tobacco stems, 500 lbs., broadcast	Wood ashes, 50 bushels. Tobacco stems, 500 lbs.	Wood ashes first two years, tobacco stems last year	57.8	89.6	96.8

REPORT ON OATS.

Nineteen varieties of oats were grown at the Station the past year, in 1-32 acre plots. No yields are given from smaller plots.

The soil is a clay loam, moderately fertile. It had been cropped for four years without fertilizers until this season, when superphosphate was applied, broadcast, after the oats were through the ground, at the rate of two hundred pounds per acre.

The ground was plowed April 13th, but frequent rains prevented sowing until the 23d. Then the soil was in excellent condition, having been thoroughly pulverized with the Acme harrow and the roller. All plots were sowed at the rate of two bushels per acre, with the Buckeye drill. The seed vegetated slowly, and the plants were not fully through the ground until May 6th, but the stand was almost perfect, and the growth was very strong during the entire season.

The varieties all stood up so well that observations on strength of straw were of no particular value. It should be noted though in this connection, that varieties which were not harvested previous to July 22d were badly lodged by a storm on that date. This storm was preceded by several days of hot weather, which, in connection with it, may have injured these varieties somewhat, especially as regards weight per measured bushel. No variety ripening after this date weighed up to the standard bushel of thirty-two pounds.

In the following table a bushel is thirty-two pounds, and the weight of a measured bushel means the quantity contained in a sealed measure.

Plot.	Variety.	Yield in bushels per acre.	Weight per measured bushel, lbs.	Yield of straw per acre in lbs.	Date of ripening.
1	White Russian	55.0	31	3,744	July 28
2	White Russian Improved	53.2	30	4,576	28
3	Yankee Prolific	68.5	31	4,608	28
*4	American Triumph	34.5	29	2,936	29
5	Barley Oats	80.5	37	8,160	20
6	Bohemian	51.2	40½	3,872	20
7	Clydesdale	78.0	38½	3,328	20
8	Early Dakota	71.5	31½	3,520	22
9	Early Prize Cluster	59.8	37	2,944	20
10	Kansas Hybrid	72.8	34	3,488	22
11	White German	80.2	30½	4,192	20
12	White Schoener	82.8	30	3,552	24
13	Monarch	76.0	29½	3,392	24
14	Race Horse	84.5	31½	4,704	18
15	Rust Proof	73.5	29	3,648	22
16	Welch	65.5	28	3,328	24
17	Welcome	78.5	35	3,968	20
18	White Canadian	64.8	30½	3,968	24
19	White Belgian	74.0	34	4,160	22

* This plot suffered by being too close to the road; injury estimated at about ten per cent.

The yields of the above plots are quite large, considerably exceeding those of last year on the same plots. The application of the light dressing of superphosphate may have helped to produce this result, but it is probable the better climatic conditions of the past year had more to do with it. We have not tried using special fertilizers on oats, but from experience with the other grain crops, the above conclusion is drawn. The season of 1884 was marked by a severe drouth, which materially reduced the yield of all the experiment crops, except wheat, which was out of the way. The season of 1885 was quite favorable in this regard.

These yields are not beyond the reach of the thorough farmer, as is well known from experience. The average is about 68½ bushels per acre, while the average of the crop for the State in 1884 was 29.8 bushels per acre, some counties reaching a little over 40 bushels.

Seed plays a very important part in the yield of the oat crop—perhaps more than in any other cereal. The native locality of this plant, so far as known, is in a cool, moist climate, and it seems to deteriorate quite rapidly when taken to warm latitudes subject to extremes of temperature and drouth.

Below are given a few figures in support of this conclusion. Only those varieties are used which have been grown here for two years, the seed for crop of 1885 being taken from the crop of 1884.

Variety.	Yield of grain, 1884—bushels.	Yield of grain, 1885—bushels.	Weight of bushel, 1884—lbs.	Weight of bushel, 1885—lbs.
American Triumph	60.0	*34.5	31.0	29.0
Rust Proof	57.3	73.5	30.0	29.0
Welcome	69.5	78.5	39.5	35.0
White Belgian	68.5	74.0	36.5	34.0
White Canadian	63.3	64.8	33.0	30.5
White German	65.3	80.2	32.0	30.5
White Russian	59.3	55.0	31.0	31.0
Welch	56.7	65.5	32.0	28.0

* Injured by position.

This table shows a decided increase of crop with nearly as decided decrease in quality. The weight is considered the true index to the quality of the crop. The increase in crop has already been mentioned. The seed-oats for the crop of 1884 were obtained, with but one exception, from northern grown stock. This exception was the Welcome, the seed for which was grown in northern Ohio the season of 1883. The deterioration this variety has undergone since coming into our hands is very noticeable, the grains being much smaller, and having a decidedly inferior look compared with the seed when we received it, and inferior to our first crop. The variety had just been introduced in the spring of 1883, and showed decidedly vigorous qualities.

In the above table all the varieties show a reduced weight per bushel in 1885, except White Russian. All but two, American Triumph and White Russian, show an increased product over crop of 1884. The first was badly situated; the latter was apparently as well situated as any of the plots.

From these figures and other well established observations, it seems to be a matter of prime importance where our seed-oats are grown. We intend pursuing these observations more carefuly in the future.

The following table gives some figures showing weight of straw to grain, and other facts in regard to the development of the several varieties.

Plot.	Variety.	Pounds of straw to one of grain.	Length of straw in inches.	Average number of kernels in ten heads.	Maximum.	Minimum.	Color and appearance of grain.
1	White Russian	2.1	43	73.5	102	44	White, long.
2	White Russian Improved	2.7	44	68.3	96	45	"
3	Yankee Prolific	2.1	45	88.2	112	43	White, slender, long.
4	American Triumph	2.7	42	92.7	120	68	White, long, fairly plump.
5	Barley Oats	3.2	39	62.3	81	42	White, medium length, quite plump.
6	Bohemian	2.4	39	65.2	85	49	Buff, small, spongy, hulless.
7	Clydesdale	1.3	37	61.2	86	44	White, medium length, plump.
8	Early Dakota	1.5	40	55.9	78	33	White and brownish, long, slender, very chaffy.
9	Early Prize Cluster	1.5	41	55.7	70	36	Light, buff, medium length and plump.
10	Kansas Hydrid	1.5	40	49.2	93	31	Buff and dark, long and chaffy.
11	White German	1.6	37	71.9	92	50	White, good size.
12	White Schoener	1.3	42	71.2	100	49	" "
13	Monarch	1.4	41	90.5	104	69	" "
14	Race Horse	1.7	38	58.0	102	39	White, medium length and plump.
15	Rust Proof	1.6	38	42.7	58	36	Buff and dark, long, slender, chaffy kernels and awned.
16	Welch	1.6	40	80.6	106	56	White, good size.
17	Welcome	1.6	40	54.4	65	40	White, small, short and plump.
18	White Canadian	1.9	43	66.5	80	54	White, long, good size.
19	White Belgian	1.8	40	54.4	75	33	White, long, slender.

The foregoing table expresses the important points as to the development of the different varieties, and is also somewhat descriptive.

The first three varieties were so nearly identical that no one could have recognized them as being different. They are what are commonly called side oats, the branches of the panicle all turning to one side.

No. 5 is a very vigorous, leafy plant, not above average height.

All but the first three have a spreading panicle, and those which bear white grains closely resemble each other; those bearing dark grains resemble the others, except in color of kernel.

Some of these varieties are of very doubtful origin, but we give them with the names by which they were received. It is hardly necessary to say that those showing best yield with good weight per bushel are the most valuable, and it will pay farmers to purchase these varieties if they can get them of reliable parties at prices within limits of farm profits.

The name Rust Proof has no significance, as this sort is as subject to rust as any other. It is a rather peculiar, low growing variety, with abundance of leaves about the base.

The Bohemian resembles much in outward appearance the other varieties, but belongs to a different species. Of this we will speak again.

The varieties were carefully noted in regard to stooling, but the notes were not of sufficient importance to insert figures which have a very doubtful value in the table.

The largest number of stalks found growing from one seed was six, and all of the varieties stooled some, averaging two to four stalks to the seed. The Welcome, which grew such strong, heavy stalks last year, and was not observed to stool at all, grew smaller stalks this year and stooled slightly. The variations which are constantly observed in varieties lead us to doubt more and more the value of descriptions, except those which are based on the most obvious differences of structure, color, etc., and these descriptions should be very simple.

Just before harvesting nearly all of the varieties showed traces of smut (*ustilago segetum*, *Pers.*), but the extent of the disease seemed so much greater in some varieties than in others that it led to an examination each variety separately. Portions of the Plots were selected indiscriminately, and the total number of stalks counted, noting the number affected, from which is given the following per cent. of smutted heads.

Variety.	Seed.	Per cent. of smutted heads.
White Russian	Station seed	6.2
White Russian Improved	Western seed	4.3
Yankee Prolific	North Pennsylvania seed	4.4
American Triumph	Station seed	9.5
Barley Oats	Western seed	2.8
Bohemian Oats	Northern seed	0.4
Clydesdale	"	0.7
Early Dakota	Western seed	0.5
Early Prize Cluster	"	1.5
Kansas Hybrid	"	Trace.
White German	Station seed	22.6
White Schoener	"	2.8
Monarch	Northern seed	13.4
Race Horse	"	0.2
Rust Proof	Station seed	2.4
Welch	"	14.0
Welcome	"	7.5
White Canadian	"	8.6
White Belgian	"	6.7

We offer no suggestions as to why one variety should be more affected than others except that, as is well known, plants vary in their ability to resist disease.

There is no remedy known for the prevention of this fungus growth. The spores are supposed to be present in all places, and develop or not as conditions favor or hinder. There is, however, this practical suggestion, that seed from vigorous plants, and well drained, properly prepared soil will tend very much to diminish its possible opportunities for growth.

We do not believe that the locality where seed is grown, considered aside from its vigor, has anything to do with its ability to resist the growth of smut.

The above figures show that the loss from this cause is quite severe at times, and it is frequently greater than is supposed.

On the river bottom of the University farm a piece of oats was sown very thick for oat hay; the soil was low undrained alluvial deposit, and the seeding was about twice what would be sown for a crop. This piece produced fully three-fourths smut heads, nearly destroying its value as food. This instance is simply given to show that such surroundings are not favorable to the healthy growth of oats. Further, it is probable that had they been sown much thinner the crop would not have been so badly affected.

We consider two bushels, if properly sown, abundant seed per acre for growing a crop of grain, and would not sow over three for hay crop.

BOHEMIAN OATS.

It might be expected, in view of the extraordinary methods which have been resorted to in all sections to introduce this species of oats, that we should make some special mention of it here.

The common oat is botanically *Avena Sativa L.*, to which all of our cultivated varieties which have the seed enclosed in the flowering glumes belong.

The Bohemian oat belongs to a different species, *Avena Nuda L.*, in which the grain is naked, and when ripe hangs protruding slightly from the flowering glumes.

The berry is small, of a buff grayish color, soft and spongy. Of its origin we know nothing more than that it has always been cultivated more or less along with the common oats.

Whatever we have been able to learn of its existence in Europe, it is not well spoken of, being cultivated occasionally for its grain, but not highly esteemed, regarded rather as a degraded variety of *Avena Sativa.*

As to its introduction as a grain of special importance by so called Bohemian oats associations, the whole thing is an unprincipled scheme simply to make money by fraud and deception. Its value commercially is not greater, and probably not equal to common oats.

The universal testimony of millers is that it is not so good for milling purposes as the best white oats.

The whole scheme of buying and selling them at $10 per bushel rests simply on the ability of some slick agent to secure a respectable farmer as a stool-pigeon for the first year, and this enables him usually to do a paying business, the second year after which he usually decamps, and Bohemian oats are a drug in the market at any price. No one grows them after that.

The whole scheme has been so frequently shown up that we deem it unnecessary to enter into details. Farmers are not deceived very often or made to believe that these oats have a special commercial value, but the agent makes it appear that he has sold Mr. B's crop for so much, and doubtless he has; the result is, that only too often the idea of getting much for little or nothing "staggers the good intentions of honest farmers."

There are several wheat schemes being worked in the State on precisely the same plan as this oat scheme.

EXPERIMENTS WITH POTATOES.

The tests with potatoes for the past year is a continuation of previous work. The list of varieties has been considerably extended, and an attempt has been made to make the test of methods of culture more complete. The work, as a whole, was very successfully executed, and adds the record of another year as evidence on the questions at issue.

The ground for all the work was prepared with the care of a garden bed; that for varieties having a heavy coating of compost plowed under; the part for fertilizer work was not treated with compost or other manure, only as mentioned in the table. After planting, the varieties were also treated with special potato manure at the rate of 400 pounds per acre. All cutting is two eyes to the piece, unless otherwise specified, and planted 2½ by 1 foot in the row, and four inches deep, unless stated differently in the table. The culture for all the general work was shallow, being confined to the destruction of weeds and keeping the surface mellow. None were hilled up except where so stated. The vines were not disturbed in any manner.

TEST OF VARIETIES.

The test of varieties for 1884 included fifty named sorts, and for 1885 about one hundred named sorts, with also a large number of seedlings, mostly of our own origination. On these latter we are not yet able to report with any satisfaction. The list of named varieties includes a number not offered until last year, and some which are being introduced during the present spring.

Our best endeavors were put forth to give all varieties an impartial test, and this was accomplished as nearly as it is possible under conditions of field experimentation.

The yields are all given to perfect stand. The simple fact that a variety shows a yield a few bushels greater or less than another has no particular significance for or against it, but all of the points should be well weighed. The total yield and time of ripening for 1884 of such varieties as were tested that year are given. These cumulative results add materially to the value of the tests. The yields for the past year are much superior to any variety yields heretofore published by the Station. This is principally owing to the favorable character of the season. The planting was closer than usual, and doubtless added somewhat to the total yields, but so far as could be determined worked no injury to the crop, as regards size of tuber. The list of varieties is divided into three sections: Early, medium, and late sorts. This very much facilitates comparisons. Those ripening previous to August 1st are classed as "early;" from August 1st to 20th "medium;" and those afterwards as "late sorts."

TABLE EXHIBITING RESULTS OF EARLY SORTS.—(Ripened before August 1, 1885.)

No. of plot.	Variety.	Yield of marketable potatoes.	Yield of small potatoes.	Total yield.	Date of ripening.	Yield for 1884, total bushels.	Date of ripening, 1884.	Table quality.
2	Beauty of Hebron	287.0	62.4	349.4	July 25	155.0	July 23	9½
3	Belle	86.6	39.1	125.7	" 27	98.3	Aug. 11	7
6	Boston Market	239.4	90.8	330.2	" 27	158.8	" 8	9
10	Chas. Downing	319.4	55.7	375.1	" 25			10
11	Clark's No. 1	363.0	94.9	457.9	" 30	158.8	July 18	9
93	Early Durham	335.8	90.8	426.6	" 25			8
17	Early Gem	231.4	190.6	422.0	" 25			9
18	Early Harvest	336.9	52.2	389.1	" 25	102.1	July 18	7
19	Early Ohio	324.4	68.1	392.5	" 25	90.7	" 18	8
94	Early Pearl	285.9	93.0	378.9	" 25			8
21	Early Rose	326.7	104.4	431.1	" 27	113.4	Aug. 2	9
75	Early Sunrise	170.3	27.2	197.5	" 27			6
22	Early White Prize	294.5	97.6	392.1	" 31			7½
23	Electic	220.9	24.2	245.1	" 27	109.6	Aug. 2	7
25	Gardner's Early Seedling	270.0	137.3	407.3	" 25			8
35	Lee's Favorite	423.0	48.8	471.8	" 27	124.7	Aug. 2	9
37	Mayflower	199.7	149.7	349.4	" 31	90.8	" 2	8
74	New O. K	197.4	124.8	322.2	" 31			8½
40	Nott's Victor	296.1	30.6	326.7	" 30	151.2	Aug. 2	6
43	Pearl of Savoy	353.9	32.9	386.8	" 30	113.4	July 23	8
95	Prince Edward's Early Rose	274.5	82.3	356.8	" 25			8½
51	Rosy Morn	326.7	81.7	408.4	" 30			8
27	Seedling of Extra Early Vermont	121.4	77.1	198.5	" 28			7
55	Snowflake	217.8	95.3	313.1	" 31	151.2	Aug. 2	10
56	Snow Queen	214.4	62.4	276.8	" 30			7

58	St. Patrick	249.6	47.6	297.2	July 31	121.0	Aug. 15	5
59	Stray Beauty	330.1	20.4	350.5	" 20	....	....	5
60	Telephone	188.3	95.3	283.6	" 31	102.0	Aug. 2	8
89	Thorburn	335.0	47.5	382.5	" 27	....	....	8
61	Tremont	190.6	60.1	250.7	" 30	109.6	Aug. 8	6½
62	Vanguard	195.1	81.7	276.8	" 25	86.9	July 23	8
64	Vick's Extra	90.8	95.3	186.1	" 27	75.6	Aug. 2	8½
65	Vick's Improved Peach Blow	61.3	136.6	197.9	" 31	158.8	" 8	....
68	Watson's Seedling	304.0	76.0	380.0	" 31	....	....	8

TABLE EXHIBITING RESULTS OF MEDIUM EARLY SORTS.—(Ripened August 1st to 20th, 1885.)

No. of plot.	Variety.	Yield of marketable potatoes.	Yield of small potatoes.	Total yield.	Date of ripening.	Yield for 1884. total bushels.	Date of ripening, 1884.	Table quality.
1	Alexander's Prolific	264.3	11.3	275.6	Aug. 16			6
4	Big Benefit	181.5	43.1	224.6	" 8			8
5	Bonanza	267.7	79.4	347.1	" 8			6
7	Burbank	227.5	43.6	271.1	" 8	151.2	Aug. 11	8
8	Cap Sheaf	310.8	1.1	311.9	" 8			7
9	Champion of America	263.2	19.3	282.5	" 8	143.7	Aug. 2	6
14	Cook's Superb	277.4	52.6	330.0	" 13	158.8	" 11	5
78	Cullom's Superb	360.7	5.7	366.4	" 16			7
16	Dunmore's Seedling	323.3	39.7	363.0	" 4	136.1	Aug. 2	8
33	Late Ohio	338.8	26.6	365.4	" 8	155.1	" 8	9
85	Matchless	146.3	86.2	232.5	" 17			5
41	O. K. Mammoth Prolific	335.8	34.0	369.8	" 8	151.2	Aug. 18	7
42	Parson's Prolific	298.3	81.7	380.0	" 13	151.2	" 18	5
36	Peck	221.4	38.1	259.5	" 8			6
47	Pride of the West	349.4	51.1	400.5	" 13			6
87	Queen of Roses	257.9	42.6	300.5	" 8			8
48	Queen of the Valley	279.1	36.3	315.4	" 8	158.8	Aug. 18	8
49	Red Elephant	254.1	54.5	308.6	" 8	128.6	" 27	5
50	Rochester Favorite	129.3	86.2	215.5	" 13	136.1	" 27	4
53	Salt Lake Queen	285.9	31.8	317.7	" 8			7
57	Spaulding's Seedling	170.2	79.4	249.6	" 13			6
63	Vermont Champion	229.1	61.3	290.4	" 8	151.2	Aug. 8	6
66	Vick's Prize	281.3	68.1	349.4	" 8	139.9	" 18	6
67	Wall's Orange	93.0	47.6	140.6	" 8	151.2	" 27	5
91	Weld's No. 1	275.9	26.6	302.5	" 13			7
92	Weld's No. 22	340.3	7.6	347.9	" 13			6
72	White Elephant	190.6	63.5	254.1	" 17	113.4	Aug. 27	7
73	White Star	124.8	68.1	192.9	" 13	121.0	" 27	8

TABLE EXHIBITING RESULTS OF LATE SORTS. (Ripened after August 20th, 1885.)

Plot No.	Variety.	Yield of merchantable potatoes.	Yield of small potatoes.	Total yield.	Date of ripening.	Yield for 1884. Total bushels.	Date of ripening, 1884.	Table quality.
16	Blue Victor	155.0	33 5	188.5	Aug. 27			4
12	Colvin's Excelsior	183.9	7.3	191.2	" 21			5
15	Dakota Red	158.4	76.8	235.2	" 27	158.8	Aug. 16	5
79	Dictator	313.1	81.7	394 8	" 27			6
24	Empire State	322.2	86.2	408.4	" 27			7
80	Farina	106 6	95.3	201.9	" 27			8
26	Garfield	168.2	130.7	298.9	" 21	102.1	Aug. 24	7
81	Great Eastern	234.7	84.7	319.4	" 23			5
28	Hall's Early Peachblow	131.6	45.4	177.0	" 27	83.2	Aug. 11	8
82	Home Comfort	174.7	68.1	242.8	" 27			6
29	Iroquois	121.4	77.1	198.5	" 21	68 0	Aug. 8	6
30	James Vick	406.1	43.1	449.2	" 27	158.8	" 27	6
31	Jones' Prize Taker	221.2	23.8	245.0	" 21	102.1	" 8	6
32	Jumbo	317.6	133.9	451.5	" 27	185.3	" 11	8
83	Knapp's Snowbank	344.9	53.3	398.2	" 24			5
34	La Plume Triumph	281.3	80.5	361.8	" 27	166.4	Aug. 21	7
36	Mammoth Pearl	292.7	39.7	332.4	" 21	151.2	" 11	6
38	Marvel of Beauty	270.0	31.8	301.8	" 21			6
39	Montreal	72.6	105.5	178.1	Sep. 24			
44	Perfect Gem	377.8	27.2	405.0	Aug. 21			6
45	President Lincoln	294.9	61 3	356.2	Sep. 10			7
46	Pride of Lisbon	310.8	74.9	385 7	Aug. 27			6
96	Red Star	349.4	18.2	367.6	" 28			7
52	Rural Blush	325.6	23.8	349.4	" 27	211.7	Aug. 27	8½
54	Snow Fairy	194.5	76.5	271.0	" 27			7
88	Stanton	246.8	14.5	261.3	" 21			7
134	State of Maine	249.6	43.1	292.7	" 28	147.5	Aug. 15	7
90	Weld's Jumbo	342.8	64.5	407.3	" 28			8
69	Weld's No. 14	217.8	47.6	265.4	" 27			4
71	White Chief	258.6	86 2	344.8	Sep. 5			4

The dates of ripening for the two years vary considerably in some instances, but, in the main, are more uniform than we had supposed would be the case. Those showing the greatest variation are, as a rule, the least well established varieties. The planting for 1884 was on May 3d; for 1885, on May 4th. The yields bear little enough resemblances to each other, but this is altogether a matter of attendant conditions, and in this case is fully explained in the reports for the two years. There is not in all cases a correspondence of the larger yields of the two years, yet in a majority of cases there is.

Of the early varieties, three reach above 350 bushels per acre of merchantable potatoes, viz: Clark's No. 1, Lee's Favorite, and Pearl of Savoy. Lee's Favorite shows greatest total yield, and Clark's No. 1 second best. A large number of varieties in the above list show good yields, and, on the whole, this table presents an admirable collection of early potatoes.

Of the second early, or medium sorts, Cullom's Superb, Pride of the West, and Weld's No. 22 show the best yields of marketable potatoes. The extremely low yield of small potatoes of the first and last named is remarkable. Pride of the West shows the best total yield. These three are all new varieties, but little can be said for their table qualities. The quality of all the varieties grown will be fully mentioned in another place.

Of the late sorts, James Vick, Perfect Gem, and Red Star head the list for marketable yield, and Jumbo for total yield, with James Vick second.

There are 34 of the early sorts and their average yield is 293.2 bushels; 28 of the medium sorts average yield 298.4 bushels; 30 of the late sorts with an average yield of 309.9 bushels. Lee's Favorite shows the largest total yield of all varieties, and Stray Beauty was the first to ripen. The column showing table qualities is arranged on a scale of points from 0 to 10. These were all tested on the table this season, and the results are quite fully given under "Notes on Varieties."

The testing of quality was done during December and January, after the varieties had been put into winter quarters. Chas. Downing and Snowflake head the list and are the only ones graded 10. They are about equally early; the former, apparently, is more productive than the latter. This is the first test made of the Chas. Downing, and it has not been in the market until this spring (1886). Of the others, Beauty of Hebron stands highest, 9½, and five reach 9, 14 are graded 8 (three of them 8½). In all, 22 of the early varieties are graded 8 and upwards.

Of the medium varieties, one only reaches 9 in grade of table qualities. This is Late Ohio. Six are graded 8; in all, seven are graded 8 and upwards.

Of the late varieties, Rural Blush is graded 8½; six, in all, reaching 8.

About 65 per cent. of the early sorts are graded 8 and upwards, 25 per cent. of the medium sorts, and 20 per cent. of the late sorts. Whether this would hold good for successive years we are unable to say, but the grading for table qualities the present year compares very closely with grading of last year, and we shall endeavor to ascertain in the future whether earliness has not a sensible effect upon quality. If so, it is very important for some of the early sorts, as is well known, are good keepers and are used as late in the spring as the later ripening sorts. It may be argued that some of the later sorts would show a better grade if tested later in the season, but we would suggest that if a potato is not fit for table use during the months of this trial, its practical value is lessened. It should be distinctly understood that judgment is not pronounced, either for or against a variety, upon one trial. The aim is to make the test thorough and perfectly impartial, and, if after being repeated for two or three years, a variety continues to fall below a reasonable standard, it is discarded. The soil here is certainly not the most favorable for producing good table qualities, but the comparison is thought to be fair.

Where table quality is marked below 7 it is quite poor.

NOTES ON VARIETIES.

1. Alexander's Prolific. (O. H. Alexander.) Stout, erect growth of vine, about 20 inches high, leaves medium size, slightly curled; tubers were very fine, resembling large Snowflakes somewhat, light russet, eyes not very deep, close in hill, above medium. Tested for table, skin did not break in boiling; flesh solid and white; little wet; grain and flavor not excellent; graded 6.

2. Beauty of Hebron. (I. E. Jones, 84.) Stout growth of vines, slightly decumbent, 18 inches high, leaves medium size and smooth; tubers fair, resembling Early Rose, light rose colored, smooth, shallow eyes, close in hill, medium size. Tested for the table, skin burst nicely; flesh white and firm; grain and flavor very good; graded 9½.

3. Belle. (Station.) Growth uneven, slightly decumbent, 13 inches high, light green, leaves curled and small; tubers poor, roundish and flattened, close in hill, small and scabbed, light purplish color. Tested for the table, did not break open; solid and white; grain and flavor fair; graded 7.

4. Big Benefit. (J. C. Everett.) Fairly strong growth of vine, 18 inches high, slightly decumbent, light green, leaves smooth, medium size; tubers very fair, smooth, few eyes, close in hill, light purple color. In Cooking skin did not break; solid, white; flavor and grain very fair; graded 8.

5. Bonanza. (Frank Ford & Son). Strong, erect growth, 21 inches tall, green, smooth leaves, of medium size; tubers fair, roundish, light purplish color, close in hill, smooth, above medium size. Cooking test; skin broke a little; solid, white; grain fair; flavor flat and watery; graded 6.

6. Boston Market. (Ford & Son, 84.) Strong growth, decumbent, 20 inches high, foliage green, smooth and medium size; tubers very fair, light purple tint, close in hill, above medium. Cooking test; skin broke well in boiling; flesh solid, dark, dry; grain fine; flavor good; graded 9.

7. Burbank. (Station.) Strong, erect growth, 18 inches high, foliage light green; tubers very fair, long and flattened, smooth, light color, medium size, close in hill. Cooking test; skin did not break; flesh solid and white; grain fine, and flavor good. Not so dry as Burbanks usually are; graded 8.

8. Cap Sheaf. (J. C. Everett.) Strong growth, slightly decumbent, 20 inches high, leaves green, smooth and large; tubers very fair, very much resemble Burbanks, close in hill, medium size. Cooking test; skin did not break; solid, white; little wet, otherwise very fair; graded 7.

9. Champion of America. (Henderson, 84.) Strong, erect growth, 20 inches high, light green, leaves medium; tubers very fine, long and round, smooth, light rose tint, large size, close in hill. Cooking test; skin broke a little; flesh solid and white; grain only fair; flavor flat and watery; graded 6.

10. Chas. Downing. (Alexander.) Strong, nearly erect, growth 22 inches high, foliage green, smooth and medium size; tubers very good, of roundish form, medium size, little scattered in hill, smooth, light color. Cooking test; skin broke well in boiling; firm white flesh; flavor and grain excellent; graded 10. We consider this *one* of the new varieties worthy of commendation.

11. Clark's No. 1. (Jones, 84.) Strong growth, slightly decumbent, 22 inches high, foliage green, slightly curled, medium size; tubers very fair, resemble Rose, are little lighter in color, close in hill, smooth, medium size. Cooking test; skin broke a little; solid, dark colored flesh; grain excellent; flavor fair; graded 8.

12. Colvin's Excelsior. (Geo. H. Colvin.) Strong, nearly erect, 20 inches high, foliage pale, and medium size; tubers good, roundish in form with rather deep eyes, reddish brown color, close in hill, above medium. Cooking test; solid and white flesh, wet and poor; graded 5.

14. Cook's Superb. (Jones, 84.) Strong, decumbent, 22 inches high, foliage light green, medium size; tubers very fair, long, smooth, light, russet skin, close in hill, a few are scabbed, above medium size. Cooking test; very poor, wet things; graded 5.

15. Dakota Red. (Livingston, 84). Fair growth, decumbent, 18 inches high, foliage green, curled, medium size; tubers poor, ill-shaped and small, close in hill, reddish brown cast. Cooking test; very poor wet things; graded 5. This variety has deteriorated very much in appearance during the past two years, and is practically worthless here.

16. Dunmore's Seedling. (Jones, 84.) Strong growth, 20 inches high, light green, leaves curled, medium size; tubers fair, round and flattened, resemble Mammoth Pearl, except skin is not russet enough, close in hill, light color, some scabbed, medium size. Cooking test; skin broke fairly well; flesh firm and white; flavor and grain good; graded 8.

17. Early Gem. (Livingston, 84.) Growth strong, decumbent, 20 inches high, foliage green, smooth; tubers fair, rather small, close in hill and near to surface, smooth, longish, light with pinkish cast. Cooking test; broke fairly well; flesh firm, rather dark; flavor and grain very fair; graded 9.

18. Early Harvest, (Geo. W. Campbell, 84). Growth strong, decumbent, 20 inches high, foliage light green, leaves smooth; tubers very fine, longish, smooth, rose brown, close in hill and near to surface, medium size. Cooking test; broke little, fairly dry; flesh firm, little dark; grain fair, little waxy; flavor little strong; graded 7.

19. Early Ohio. (Station.) Strong, erect, 20 inches high, foliage green and smooth; tubers fair, little longer than thick, smooth, few scabby, rose brown, close in hill, fair size. Cooking test; broke a little; flesh firm, dark colored; grain and flavor good; graded 8. Not up to standard of this variety.

21. Early Rose. (Station.) Fair growth, 18 inches high, decumbent, foliage light green; tubers fair, longish, rose, or reddish brow color, close in hill, smooth, medium. Cooking test, burst fairly well; firm, little dark; grain and flavor excellent; graded 8.

22. Early White Prize. (Colvin.) Strong, erect, 20 inches high, foliage light green; tubers longish, smooth, eyes quite deep, light color, close in hill, above medium. Cooking test; did not break in boiling; flesh solid, white, fairly dry; grain and flavor fair; graded 7½.

23. Electric. (Ford & Son, 84.) Medium growth, erect, 18 inches high, foliage green, curled; tubers fair, long, purple and brown, some rough, close in hill, fair size. Cooking test; broke a little; solid, yellow flesh; grain and flavor fair; graded 7.

24. Empire State. (Burpee.) Strong, erect, 22 inches high; tubers large, white, smooth, close in hill. Cooking test; did not break; solid, dark color; grain and flavor only fair; graded 7.

25. Gardner's Early Seedling. Growth strong, erect, 20 inches high; foliage light green and smooth; tubers long, smooth, light with rose tint, close in hill and near to surface. Cooking test; broke little in boiling; flesh firm, white; grain and flavor excellent; graded 8½.

26. Garfield. (Ford & Son, 84.) Growth fair, decumbent, 18 inches high; foliage green, curled, rather small; tuber resembles Snowflakes, rather small, close to surface. Cooking test; did not break in boiling; solid, white; grain and flavor fair, little waxy; graded 7.

27. Seedling of Extra Early Vermont. (————) Growth only fair; decumbent, 16 inches high; foliage light green; tubers long, smooth, blue slatish color, close in hill, rather small. Cooking test; did not break; solid, rather dark flesh, little wet and waxy; graded 7.

28. Hall's Early Peach Blow. (Gregory, 84) Growth only fair; 14 inches high; foliage light green, curled; tubers roundish and long, smooth, light and brownish, with pink in the eyes, close in hill, fair size. Cooking test; did not break, solid, nearly white; grain fine; flavor quite good; graded 8.

29. Iroquois. (Bliss, 84.) Growth fair, decumbent, 18 inches high; foliage green, curled, small; tubers white, small, close in hill and to surface. Cooking test, wet and poor; graded 6.

30. Jas. Vick. (Ford & Son, 84.) Strong, erect, 20 inches high; foliage green and smooth; tubers very fine, except some ill-shapen, longish, light and russet, close in hill and near to surface, above medium. Cooking test; did not burst, solid, dark and watery; strong odor; flavor flat; graded 6.

31. Jones' Prize Taker. (J. A. Everett, 84.) Medium growth, decumbent, 18 inches high; foliage light green; tubers very much resemble 30, only are smaller, close in hill, smooth medium. Cooking test; did not break; solid, white, fair grain, and good flavor; graded 8.

32. Jumbo. (Henderson.) Strong, decumbent, 20 inches; foliage light green, curled; tubers roundish flattened after Mammoth Pearl type, light, russet, very close in hill, some very fine. Cooking test; broke just a little; fair grain and flavor; graded 8.

33. Late Ohio. (Station.) Strong, erect, 22 inches; foliage green, curled; tubers resemble very much the Early Ohio, rose brown color. Cooking test; broke some; solid, fairly white and dry; fine grain and good flavor; graded, 9.

34. La Plume Triumph. (I. F. Tillinghast) Strong, nearly erect, 22 inches; foliage, light green, curled; tubers smooth, rather long, medium size, close in hill, rose brown color. Cooking test; broke little, solid, rather dark, coarse, flavor poor; graded 7.

35. Lee's Favorite. (Frank Ford & Son, 84.) Strong, decumbent, 20 inches tall; foliage green and smooth; tubers Burbank shape, but eyes and color are different, smooth, light rose tint, rather scattering in hill, medium size. Cooking test; broke very well, not all solid at center; grain fine; flavor not extra; graded 9.

36. Mammoth Pearl. (Station.) Strong growth, 28 inches high, decumbent; tubers roundish flattened, light russet, fairly deep set eyes, close in hill and near to surface. Cooking test; did not break, solid and white; grain coarse; flavor not good, watery; graded 6.

37. May Flower. (Henderson, 84.) Strong, decumbent. 22 inches; foliage light green; tubers roundish small, somewhat after Snowflake type, light, russet, close in hill and to surface. Cooking test; broke little, solid, white; grain and flavor fairly good; graded 8.

39. Montreal. (Alexander.) Very strong growth, 28 inches high; dark green foliage. Grew until frost killed it, and was an utter failure, bearing but a few small tubers.

40. Nott's Victor. (R. Nott, 84.) Fair, nearly erect, 18 inches; foliage light green; tubers roundish, light with pink tint, smooth, few eyes, close in hill and to surface, medium size. Cooking test; did not break, solid, white; grain and flavor poor, waxy; graded 6.

1. O. K. Mammoth Prolific. (Livingstons.) Strong, decumbent, 24 inches; foliage green, smooth; tubers, light colored russet, medium size, close

74. New O. K. (Livingston, 84.) Strong, decumbent, 20 inches high; foliage light green; tubers longish flattened, above medium, light and pale rose tint; cooking test; did not break; grain and flavor quite good; graded 8½.

75. Early Sunrise. (Livingston, 81.) Medium growth, decumbent, 16 inches high; foliage light green; tubers rather long brownish red, small eyes, close in hill, smooth, medium; cooking test; did not break, solid, white; grain little coarse, flavor flat, watery; graded 6.

76. Blue Victor. (L. C. Alwood.) Strong, erect, 21 inches high; foliage dark green and rather scanty; tubers round and uneven, eyes rather deep, light and strongly banded with purple, scattering, scabby, above medium; cooking test; very poor things; graded 4,

78. Cullom's Superb. (W. E. Weld.) Strong, erect, 22 inches high; foliage green and large; tubers very fine, long, light and russet, scattering in hill, above medium; table qualities rather poor; graded 7.

79. Dictator. (Thorburn & Co.) Strong, erect, 22 inches high; tubers resemble Mammoth Pearl in shape and appearance, smooth, close in hill, above medium; table qualities poor; graded 6.

80. Farina. (Weld.) Strong, erect, growth 20 inches high; foliage light green; tubers long and smooth, white, close to surface and straggling, barely medium; cooking test; broke a little in boiling, solid, white; grain fine and flavor good; graded 8. These are so long that their shape is objectionable.

81. Great Eastern. (Thorburn & Co.) Medium growth, decumbent, 18 inches high; foliage light green; tubers resembles Mammoth Pearl, close in hill, scabby, medium size; cooking test; did not break, flavor strong, is waxy and flat; graded 5.

82. Home Comfort. (Weld.) Strong, erect, 20 inches high; foliage curled; tubers long, flattened, smooth, light rose tint, scattered in hill, medium size; table qualities, poor; graded 6.

83. Knapp's Snowbank. (Weld.) Strong, erect, 22 inches high; foliage light green, wrinkled; tubers resemble Snowflakes, more round and larger, close in hill, some scabby, above medium; cooking test, poor things; graded 5.

85. Matchless. (Weld.) Strong, decumbent, 20 inches high; foliage slightly curled; tubers rather small, somewhat on Snowflake type, close in hill, russet; table qualities poor; graded 5.

86 Peck (Weld.) Strong, decumbent, 20 inches high; tubers good size, light, with pink coloring, small eyes, close in hill; table qualities poor.

87. Queen of Roses. (Weld.) Strong, decumbent, 20 inches high; tubers above medium size, between brown and light red, close in hill. Cooking test; broke a little, solid, dark, grain fair, flavor good, 8.

88. Stanton. (Weld.) Strong, erect, 20 inches high; foliage light green; tubers roundish in form, shallow eyes, brownish red, close in hill, smooth, good size. Cooking test; did not break, solid, very white, grain good, flavor flat, watery, 7.

89. Thorburn. (Thorburn & Co) Medium, erect, growth 18 inches high; tubers fine, large, white with slight purple tint close in hill. Cooking test; burst open a little, solid, white, grain good, flavor fair, graded 8.

90. Weld's Jumbo. (Weld.) Strong, erect, 24 inches high; tubers large and fine, smooth, close in hill, light color. Cooking test; did not break, solid, white, good grain and flavor, graded 8.

91. Weld's No. 1. (Weld.) Strong, erect, 22 inches high; foliage light green, small and curled; tubers large, light with pinkish color on portions, shallow eyes, smooth, scattering in hill. Cooking test; burst little, solid, white, little wet and waxy, flavor low, graded 7.

92. Weld's No. 22. (Weld.) Strong, erect, 22 inches high; tubers much

resemble previous, very fine appearing. Cooking test; burst a little, solid, very white, grain good, watery, 6½.

93. Early Durham.. (C. E. Allen.) Strong, erect, 20 inches high; foliage light green; tubers fair size, some misshapen, light rose color, scattering in hill. Cooking test; broke a little, solid, white, little waxy, flavor fine, graded 8.

94. Early Pearl. (J. A. Everett.) Strong, slightly decumbent, 20 inches high; tubers longish, smooth, rose brown color, scattering in hill, above medium. Cooking test; burst open well, solid, little dark, grain and flavor quite good, graded 8½.

95. Prince Edwards Early Rose. (J. A. Everett.) Strong, decumbent, 20 inches high; tubers fair, medium size, rose tint, smooth, close in hill and to surface. Cooking test; burst open fairly well, solid, white, grain and flavor good, 8½.

96. Red Star. (J. H. Everett.) Strong, erect, 22 inches high; tubers large and fine, pink, smooth, scattering in hill. Cooking test; burst a little, solid, white, waxy, flavor fine, graded 7.

134. State of Maine. (Burpee.) Strong, erect, 20 inches high; foliage light green; tubers somewhat resemble Mammoth Pearl, close in hill, above medium. Cooking test; did not burst, solid, white, coarse and wet, graded 7.

136. O. K. Mammoth Prolific. (Livingston.) Strong, erect, 20 inches high; foliage small and curled; tubers resemble previous, medium size. Cooking test, burst little, solid, white, grain and flavor good, graded 8.

SEEDLING VARIETIES.

From the large number of seedlings grown in 1884 some thirty were selected as the most promising, and grown the past year. The growth of vines was quite remarkable with some of these, but the yields were in all cases small and no full report will be given this year. In most cases they ripened late. Many of them produced a few fine tubers. Some tubers and seed of two species of wild potatoes, discovered by Mr. J. G. Lemmon, of Oakland, Cal., growing high up the Sierra Nevadas, were planted, but in our rich soil they failed to produce tubers, except in one instance, where three very small ones formed. The vines grew vigorously and were quite a novelty. We had hoped that they might, by constant culture, be improved, either through the seed or tuber, but now think the conditions here so unnatural as to make this impossible. They bloomed profusely for weeks but bore no seed.

METHODS OF CULTURE.

The subjebt of depths of planting is first presented under this head, or rather ridge and flat culture and different depths. These were planted adjacent to the variety plots and in a similar manner, and were fertilized the same. The surface or ridge culture is the old style of planting on the surface, giving deep culture and hilling up; the furrow planting is four inches deep, except where otherwise stated, and received shallow culture.

The variety used was Mammoth Pearl, cut two eyes to the piece. All ripened quite evenly.

How planted.	Yield of large tubers.	Yield of small tubers.	Total yield.
	Bushels.	*Bushels.*	*Bushels.*
Surface planting	217.8	44.8	262.6
Furrow "	263.2	15.9	279.1
Surface "	215.2	57.6	272.8
Furrow "	299.7	35.2	334.9
" " 6 inches	285.8	34.0	329.0
" " 8 inches	226.8	20.4	247.2
" " 10 inches	183.7	27.2	210.9
" " 12 inches	150.7	24.9	175.6

The work similar to this for 1884 showed no results upon which an argument could be based, but the above table presents some points worthy of consideration. The season of 1884 being so out of the normal conditions usually prevailing, may, in some measure, and doubtless does account for the differences in results. The first three plots of the above table do not vary materially in total yield, but show a quite marked variation in yield of large potatoes; the advantage being decidedly with furrow planting. It is also worthy of mention that the per cent. in number of large potatoes to small was very much better in furrow planting. Plot four also belongs with the three just mentioned, but it shows such a decided gain in total yield, as well as large tubers, that the comparison is better between the first three. Comparing the entire table, the maximum of large tubers and of total yield is reached at plot four, and from this the yields decrease quite evenly to the greatest depth. The tubers in all plots above four inches deep were found at a depth two to three inches less than that of planting. None of the other plots reach in yield of small tubers the two plots of surface planting.

CUTTING OF SEED.

Considerable work was done to study the effect of cutting the tuber, and, also, what part of the tuber, if any, shows the greatest vigor. To this end choice seed of standard varieties was procured from different sources, and was variously treated to study the results. First is presented a table of general work in cutting, in which but one variety is used, Burbanks.

The eighteen plots here given is a continuation of work which has now been in progress for three years, and the general averages given below the table emphasize the previous results. The maximum of total yield is at plot one, and of large tubers, at plot nine, both planted with large, whole seed. The general averages also give whole seed a decided preference, both as to total yield and large tubers; but the extremely large yield of small tubers is against them.

The time of ripening for ordinary and one-eye cutting was August 17th to 21st; whole seed ripened five to seven days earlier.

Plot.	Seed.	Yield of large tubers.	Yield of small tubers.	Total Yield.
		Bushels.	*Bushels.*	*Bushels.*
1	Large, whole seed	258.6	149.7	408 3
2	Small, "	193.6	72.6	266.2
3	Large, cut once lengthwise	231.4	106.6	338.0
4	Small, " "	154.6	46.8	201.4
5	Large, cut crosswise (stem end)	243.6	74.9	318.5
6	" " (seed end)	254.1	86.2	340.3
7	Cut, ordinary	249.6	31.8	281.4
8	Cut, one eye	78.2	5.6	83.8
9	Large, whole seed	263.2	72.6	335.8
10	Cut, one eye	134.8	13.0	147.8
11	Large, whole seed	199.7	104.4	304.1
12	Cut, one eye reversed	173.1	11.2	184.3
13	Large, whole seed	217.8	106.6	324.4
14	Cut, one eye reversed	193.6	14.5	208.1
15	Large, whole seed	258 9	99.2	358.1
16	Cut, ordinary	160.8	38.9	199.7
17	Cut, on eye	122.5	7.9	130.4
18	Cut, one eye reversed	158.8	9.1	167.9
	Average of whole seed	239.6	106.5	346.1
	Average of ordinary cuts	205.2	35.3	240.5
	Average of one eye cuts	111.8	8.8	120.6
	Average of one eye reversed cuts	175.1	11.6	186.7

The terms "ordinary," "one eye," and "one eye reversed," have been explained fully in previous reports, but we add here that the first means two eyes to the piece, the second is cut slanting toward butt and to center, for the third reverse the tuber, cut off seed end and then cut to center as for previous.

It has been argued frequently in public print that the one eye system of cutting was superior to other methods for several reasons, among which are saving of seed, increased percentage of large tubers, etc., etc. We have always admitted without dispute both of these propositions but have maintained that this system of cutting was not practical, and should not be recommended for ordinary culture for the simple reason that such small cuttings to a greater or less extent impaired the vitality of the plant. Under perfect conditions of climate and cultivation there is no question, but that extraordinary results may be accomplished with this method of cutting, and so it might with some other method.

These small cuts should be planted closer than large ones, must not be covered to deep, and in a drouth are almost sure to fail where whole seed or large cuttings will produce a fair crop. The supposition has been advanced that on account of the internal structure of the tuber, this method of cutting one eye to the center, slanting the knife toward the stem end, was advantageous in this, that it maintained intact a supposed branch of which the "eye" is the terminal bud. The appearance of the internal structure of the potato gives ground for such a conclusion, but on well authenticated facts this supposition can not be maintained. For we have repeatedly turned the potato, and cut across the supposed internal branch immediately beneath the bud, and secured as good results from such cutting as from pieces cut so as to maintain intact the supposed internal branch.

Thus, in the above table reversed cutting shows a remarkably better yield than the most approved "one eye cutting." This we cannot explain, but consider it one of the freaks of plot experimentation. However, both results when compared with ordinary and whole cuts teach the same general truth. The following table presents other work bearing on the same question:

	Yield of large tubers.	Yield of small tubers.	Total yield.
Beauty of Hebron—one eye	238.3	65.8	304.1
" " ordinary	285.9	59.0	344.9
Rural Blush—one eye	208.7	29.5	238.2
" " ordinary	274.5	25.0	299.5
O. K. Mammoth Prolific—one eye	222.6	24.2	246.8
" " " ordinary	254.1	81.7	335.8
Early Ohio—one eye	163.4	43.1	206.5
" " ordinary	247.3	34.0	281.3
Burbank—one eye	176.7	26.6	203.3
" ordinary	272.3	34.0	306.3
Mammoth Pearl—one eye	215.5	36.3	251.8
" " ordinary	290.4	47.2	337.6
White Elephant—one eye	129.3	15.9	145.2
" " ordinary	162.1	31.5	193.6
Snowflakes—one eye	136.1	45.4	181.5
" ordinary	136.1	27.2	163.3
Average of one eye	186.3	35.8	222.1
" ordinary	240.3	42.4	282.7
Excess of ordinary	54.0	6.6	60.6

The above table corroborates the previous with strong testimony. In every instance but one, ordinary cuts exceed in yield the one eye cuts. This was with Snowflakes, and is readily understood by all who know the character of this potato.

The excess in yield with ordinary cuttings is a fraction over 60 bushels per acre; omitting Snowflakes it is a fraction over 77 bushels.

It seems that this is quite conclusive evidence that under ordinary conditions the larger cuttings are superior to one eye, and enough superior to amply repay the extra outlay of seed. These were all close planting, 2½x1 foot. The soil for these plots was not quite so fertile as for varieties.

In concluding the work on cutting of seed is presented the results in detail of a study of the vigor of the eyes of the tuber, as affected by position. For this work very choice tubers were selected, and the eyes carefully placed in regular order from the stem to the seed end. Every eye being used.

We remark here that in the ordinary one eye cutting, none but the eyes from the body of the potato where they could be cut with equal amounts of substance were used. Where possible, in the following table, the eyes are grouped into three equal sections, viz., butt, middle and tip; but where not, the middle section is given the larger number.

		No. of eyes on each section.	No. of large tubers from each section.	No. of small tubers from each section.	Total No. of tubers from each section.	Weight of large tubers from each section—ounces.	Weight of small tubers from each section—ounces.	Total weight for each section—ounces.	Total weight for each tuber—ounces.	Average weight for each piece planted—ounces.
Early Ohio	Butt	5	14	10	24	16.0	9.0	55 0	199.25	12.45
	Middle	6	20	7	27	97.5	6.0	103.5		
	Tip	5	11	4	15	39.0	1.75	40.75		
Mam'oth Pearl	Butt	4	19	10	29	71.25	9.0	80.25	167.75	14.00
	Middle	4	11	5	16	42.50	4.75	47.25		
	Tip	4	9	4	13	38.25	2.0	40.25		
Beauty of Hebron	Butt	5	21	11	32	69.75	6.75	76.5	212.25	13.26
	Middle	6	29	8	37	88.50	6.50	95.0		
	Tip	5	10	3	13	37.75	3.0	40.75		
Burbank's—Mich. seed	Butt	9	48	24	72	118.75	17.0	135.75	385.25	14.30
	Middle	9	38	6	44	156.60	2.50	158.50		
	Tip	9	28	7	35	87.25	3.75	91.0		
Burbank's—Station seed	Butt	8	23	11	34	89.50	9.25	98.75	380.00	15.20
	Middle	9	44	10	54	185.0	8.25	193.25		
	Tip	8	24	8	32	80.0	8.0	88.0		
Snowflake	Butt	6	13	15	28	48.0	9.75	57.75	201.75	11.2
	Middle	6	17	19	36	60.50	11 25	71.75		
	Tip	6	19	19	38	60.50	11.75	72.25		
O. K. Mammoth Prolific	Butt	3	11	9	20	44.0	4.5	48.5	165.25	16.52
	Middle	4	19	6	25	74.0	7.5	81.5		
	Tip	3	6	17	23	27.5	7.75	35.25		
Rural Blush	Butt	5	20	13	33	63.5	8.25	71.75	194.0	12.10
	Middle	6	26	6	32	79.5	4.5	84.0		
	Tip	5	8	8	16	31.0	7.25	38.25		

TABLE OF AVERAGES.

	Average number of eyes to each section.	Average number large tubers to each section.	Average number small tubers to each section.	Average total number of tubers to each section.	Average weight of large tubers to each section—ounces.	Average weight of small tubers to each section—ounces.	Average total weight to each section—ounces.
Butt eyes	5.6	21.1	12.8	33.9	68.84	9.2	78.04
Middle eyes	6.2	25.5	8.3	33.8	98.00	6.4	104.40
Tip eyes	5.6	14.3	11.2	25.5	50.15	5.65	55.80

	Total number of eyes planted.	Average number of large tubers for each eye planted.	Average number of small tubers for each eye planted.	Total number for each eye planted.	Average weight of large tubers for each eye planted, ounces.	Average weight of small tubers for each eye planted, ounces.	Total weight for each eye planted, ounces.
Butt eyes	45	3.7	2.3	6.0	12.2	1.6	13.8
Middle eyes	50	4.1	1.3	5.4	15.7	1.0	16.7
Tip eyes	45	2.5	1.5	4.0	8.9	1.0	9.9

Of the eight varieties, the maximum yield occurred in the butt section four times, middle section four times, tip section no time. The minimum yield occurred in butt section two times, middle section no time, tip section six times.

To sum up the three preceding tables in a few words, we would say that the evidence would not warrant the use of whole seed, as this is very wasteful without a corresponding increase of crop; the argument in favor of it being principally a gain of a few days in ripening, and additional vigor to resist drouth, also increased yield. The general work tends to show that the yield of large tubers will not as a rule much exceed good ordinary cut seed.

Another objection is that large, whole seed produces a much larger quantity of small tubers.

The results do not sustain the use of one eye cuttings, this is very decided. This point is discussed more at length elsewhere. The advantage of cutting so as to maintain a supposed internal structure is not and has not in any of our experience been sustained. That ordinary cutting is best under general conditions, is clearly sustained. That eyes from certain parts of the tuber are more productive than others, is not sustained by a particle of evidence as would be seen if the whole record of yield from single eyes was given, but the general table given above illustrates this point sufficiently. The whole question of productiveness is so far as we can discern a matter of vigor, and the evidence is clear that this is largely influenced by size of cutting.

In the above table the central portion show the best yield and butt portion second.

We define ordinary cutting to mean never less than two eyes, except in very large tubers having few eyes when they are cut separate, and three eyes are not used, except is case of many eyed sorts.

The tip is never used in experiment work by us, unless so stated, but in ordinary culture it forms on piece. We always cut to the center, slanting the knife a little toward the butt of the tuber, turning it around as we progress; in this manner the most uniform cuttings can be made.

FERTILIZERS.

The soil for this work is similar to that for varieties, being an adjacent plot or plots. The size of plots and style of planting was also similar. It received no dressing of stable manure, but was ordinary well tilled and moderately fertile soil. The fertilizers were applied to each plot separately after it had been laid off and furrowed to receive the seed, being in each case well worked into the soil.

The seed was White Elephant, cut two eyes to the piece, the seed end not being used. All were planted 2½x1 ft., and four inches deep. The ripening was quite uniform, being slightly earliest with the plots showing best results.

The following table gives detailed results of fertilized and unfertilized plots:

Plot.	How treated.	Yield of large tubers.	Yeild of small tuber.	Total yield.
		Bushels.	*Bushels.*	*Bushels.*
1	Special potato manure, 800 lbs. per acre	235.9	61.3	297.2
2	Unfertilized	238.9	44.5	283.4
3	Special potato manure, 400 lbs. per acre	297 2	31.8	329.0
4	Unfertilized	226.9	28.6	265.5
5	Special potato manure, 200 lbs. per acre	294.9	36.3	331.2
6	Unfertilized	245.0	43.1	288.1
7	Muriate of potash, 800 lbs. per acre	243.6	32.8	276.4
8	Unfertilized	299.5	36.3	335.8
9	Muriate of potash, 400 lbs. per acre	231.4	32.8	264.2
10	Unfertilized	285.9	45.4	331.3
11	Muriate of potash, 200 lbs. per acre	322.2	45.4	367.6
12	Unfertilized	240.5	34.0	274.5
13	Superphosphate, 800 lbs. per acre	317.6	49.9	367.5
14	Unfertilized	304.0	40 9	344.9
15	Superphosphate, 400 lbs. per acre	326.7	47.6	374.3
16	Unfertilized	285 9	63.5	349.4
17	Superphosphate, 200 lbs. per acre	347.1	63.5	410.6
18	Unfertilized	288.1	59.0	347.1
19	Muriate of potash, 600 lbs. Sulphate of ammonia, 400 lbs. } per acre	184.8	26.4	211.2
20	Unfertilized	231.4	54 5	285.9
21	Lime, 100 bushels per acre	174.4	38.6	213.0
22	Unfertilized	124.8	47.6	172.4
23	Lime, 50 bushels per acre	229.1	31.8	260.9
24	Unfertilized	172.4	38.6	211.0
25	Lime, 25 bushels per acre	186.0	29.5	215.5
26	Unfertilized	186.3	38.7	225.0
29	Hen manure, 5 tons per acre	227.5	29.0	256.5
30	Unfertilized	190.6	74.9	265.5
31	Hen manure, 2 tons per acre	222.6	53.2	275.8
32	Unfertilized	188.3	56.7	245.0
33	Wood ashes, 100 bushels per acre	195.1	40.8	235.9
34	Unfertilized	175.6	56.2	231.8
35	Wood ashes, 50 bushels per acre	181.5	43.1	224.6
36	Unfertilized	164.6	31.5	196.1
37	Wood ashes, 25 bushels per acre	145.2	36.3	181.5
38	Muriate of potash, 600 lbs. Wood ashes, 25 bushels } per acre.	159.2	28.1	187.3
39	Unfertilized	186.0	45.4	231.4
40	Coal ashes, 20 tons per acre	170.2	27.3	197.5
41	Unfertilized	158.8	31.8	190.6
42	Coal ashes, 10 tons per acre	190.6	36.3	226.9
43	Unfertilized	182.7	46.8	229.5
44	Coal ashes, 5 tons per acre	180.3	39.8	220.1
45	Unfertilized	190.0	60.9	250.9
46	Muriate of potash, 600 lbs. Coal ashes, 10 tons } per acre	175.0	30.0	205.0
47	Unfertilized	217.8	34 0	251.8
48	Compost, 20 tons per acre	175.6	44.5	220.1
49	Unfertilized	242.0	40.3	282.3

Plot.	How treated.	Yield of large tubers.	Yield of small tubers.	Total yield.
		Bushels.	*Bushels.*	*Bushels.*
50	Compost, 10 tons per acre	288.1	51.1	329.6
51	Unfertilized	285.7	60.9	346.6
52	Compost, 10 tons Muriate of potash, 400 lbs } per acre	290.4	45.1	335.5
53	Unfertilized	324.3	38.7	263.0
54	Guano, 800 lbs. per acre	266.2	48.4	314.6
55	Unfertilized	261.4	38.2	299.6
56	Guano, 400 lbs. per acre	281.3	36.3	317.6
57	Unfertilized	338.1	25 0	363.1
58	Guano, 200 lbs. per acre	379.6	25.0	404.6
59	Unfertilized	317 6	27.2	344.8
60	Guano, 400 lbs Muriate of potash, 400 lbs } per acre	305.4	25.0	330.4

In order to get a good comparison from the above table, the following comparative table is arranged. This includes comparisons of results from the different substances used, with the unfertilized plots beside them.

No. plots treated.	How treated.	Average yield of large tubers.	Average yield of small tubers.	Ave'ge total yield.	Maximum total yield from each.	Quantity of fertilizer used per acre for maximum yield.
3	Special potato manure	243.0	43.1	286.1	331.2	200 lbs.
3	Unfertilized	236.9	42.1	279.0	288.1	....
3	Muriate of potash	265.7	37.0	302.7	367.6	200 lbs.
3	Unfertilized	275.3	38.5	313.8	335.8	....
3	Superphosphate	330.5	53.6	384.1	410.6	200 lbs.
3	Unfertilized	292.6	54.5	347.1	349.4	....
3	Lime	196.5	33.3	229.8	260.9	50 bu.
3	Unfestilized	161.1	41.6	202.7	225.0	....
2	Hen manure	225.0	41.1	266.1	275.8	2 tons.
2	Unfertilized	189.4	65.8	255.2	265.5	....
3	Wood ashes	173.9	40.1	214.0	235.9	100 bu.
3	Unfertilized	175.4	44.3	219.7	231.8	....
3	Coal ashes	180.3	34.5	214.8	226.9	10 tons.
3	Unfertilized	177.1	46.5	223.6	250.9	....
2	Compost	231.8	48.0	279.8	339.6	10 tons.
2	Unfertilized	263.8	50.6	314.4	346.6	....
3	Guano	315.7	36.5	352.2	404.6	200 lbs.
3	Unfertilized	305.7	30.1	335.8	363.1	....

Several plots of the preceding table are not included in the above, being those where mixtures were used.

That the fertilizers were, in some cases, injurious is plainly to be seen, but it is just as evident that in others they were decidedly beneficial. The cases of injury appear generally to be where the quantity used was excessive.

In order to furnish ample plots for comparison every other one was left unfertilized, except in one instance, where it was overlooked.

This gives an admirable basis of comparison, each series being composed of an equal number of fertilized and unfertilized plots. On this fact is based the comparative table above given. The average total yields are very close together, being as follows:

	Average yield.		Total.
	Large.	Small.	
Fertilized 30 plots	241.4 bu.	38.9 bu.	280.3 bu.
Unfertilized 28 plots	235.4 bu.	44.7 bu.	280.1 bu.

This is accounted for by the fact of the heavy application of fertilizer, in many cases reducing the yield below the unfertilized plots.

The maximum yields for fertilized and unfertilized plots compared show a difference, on the average, of 21.9 bushels in favor of the fertilized plots. This is certainly significant. The fact that certain plots of each series were injured by heavy dressing of fertilizer makes the comparisons of the general table above obscure, in a certain measure the beneficial effects of the fertilizer; hence, we give the following table, taking as the basis of production for each series the average of its unfertilized plots and of the fertilized plots, the one showing the maximum yield; this shows the fertilizer in the most favorable light.

No. plots treated.	How treated.	Total yield.	Excess over unfertilized plots.
		Bu.	*Bu.*
3	Special manure—maximum	331.2	52.2
3	Unfertilized—average	279.0	
3	Muriate of potash—maximum	367.6	53.8
3	Unfertilized—average	313.8	
3	Superphosphate—maximum	410.6	63.5
3	Unfertilized—average	347.1	
3	Lime—maximum	260.9	58.2
3	Unfertilized—average	202.7	
2	Hen manure—maximum	275.8	20.6
2	Unfertilized—average	255.2	
3	Wood ashes—maximum	235.9	16.2
3	Unfertilized—average	219.7	

No. plots treated.	How treated.	Total yield.	Excess over unfertilized plots.
		Bu.	*Bu.*
3	Coal ashes—maximum	226.9	3.3
3	Unfertilized—average	223.6	
2	Compost—maximum	339.6	25.2
2	Unfertilized—average	314.4	
3	Guano—maximum	404.6	68.8
3	Unfertilized—average	335.8	

It will be readily understood by all that an absolute standard by which all plots can be compared and their favorable or unfavorable results noted, can not be given, but the results should be studied and interpreted as seems most rational. If the common average of the 28 unfertilized plots were to be used for the standard the resultant increase of crop shown in the above table would vary much more than it does, as the table now is: In a few instances there would be a deficiency; that is, the maximum yield of some of the fertilized plots is not equal to the common average of unfertilized plots. We have learned in studying the subject of fertilizers that the important thing is comparison with adjacent unfertilized plots; hence, the large number of unfertilized plots in this work, and the above comparisons are, doubtless, as reliable in their teaching as any which could be made. Whether the maximum yield of fertilized plots should be taken in the comparison is the question most difficult to settle, but it is so evident from the results set forth in the general table that some of the plots did suffer from an excessive application of the fertilizer that it is not possible to obtain an average which shall truly represent the productive capacity of the fertilizer used. Hence the maximum yield is used, which, probably to some extent, exaggerates the benefits derived from the fertilizer.

An examination of the maximum yields of fertilized and unfertilized plots of each series shows that in all but two instances the fertilized plots exceed those not fertilized,—the average excess of yield being, as before stated, 21.9 bushels. The facts are clear that the fertilizers were, in most cases, beneficial. These results are the most pronounced in favor of fertilizers of any yet reported. To measure the benefit in stated values would be difficult, and, perhaps, the attempt to do so is uncalled for in this report. It is worthy of especial notice that the best results were produced in all important cases with the minimum amount of fertilizer. The results seem to show that under the conditions of this work fertilizers can be used with profit. The season was favorable to the use of fertilizers, the rainfall being quite abundant, producing vigorous growth throughout the entire season. The condition of the tubers was excellent.

The special manure, superphosphate and potash, were purchased of the Mapes Company, New York City. The first costing $46.00 per ton, the second $55.00, and the potash $50.00 per ton. The guano cost also $50.00 per ton.

The guano produced the greatest excess of yield, superphosphate next, lime, muriate of potash, and special manure following in the order named. What ever study or comparison is made from the foregoing results, it should be borne in mind that the tests were conducted on exceptionally well prepared soil, where it was supposed the productive capacity was nearly uniform. However, this last supposition was not borne out by the results, as it will be seen that the averages of groups four, five, six, and seven are considerably below the averages of other groups. This point is additional evidence in favor of comparing each group by itself, instead of with a common average.

We might add that in using stable manure, it should always be fairly well rotted and should be plowed under to a moderate depth. It has never injured the quality of the crop for us when so used.

The result with coal ashes stands at the foot of the list, so far as yield is concerned. Heretofore they have produced results equal to the best fertilizers. Altered mechanical conditions of the soil and climatic conditions doubtless account for this.

PIG FEEDING EXPERIMENT.

In the following work a comparison of pigs fed on corn and green food was undertaken. No attempt to definitely determine the relative values of the different green foods used was made.

The plan of the experiment was as follows:

One lot fed on corn and green food.

One lot fed on corn.

One lot fed entirely on green food.

One lot fed on corn, running at large in pasture.

At the same time a fifth lot was weighed and turned at large in one of the pastures with the rest of the herd. With this last mentioned lot no attempt was made to take account of their food. The whole herd received a small quantity of old corn until August 24th, when new corn was fed. The others were fed exact quantities of corn and green food and kept entirely from other stock. Lots one, two, and three were kept in closed pens, with a small yard attached, of which they had free range. Lot four was in an open field (an old pasture, principally blue grass sod,) of about three acres, and were provided with shelter from sun and rain. The green food eaten by this lot could not be measured, but otherwise their treatment was taken account of.

The pigs were eleven Berkshires and nine Poland Chinas,—a very even lot of pigs. They had not been overly kept, but were in fair, thrifty condition,—good stock pigs.

The two breeds were quite even as to age and size, all being about sixteen weeks old.

In order to have as large a number of individuals in each pen as possible we were compelled to use the two breeds together. This does not give any comparative test of breeds, but we think does not mar the general results of the work. We remark that they fed very evenly.

The twenty pigs were divided into five lots, according to the previous plan. Lots one to four were composed of equal numbers of the two breeds, lot five, three Berkshires and one Poland China. The first four lots were also equally divided as to sex, the fifth was all barrows.

The grain for first part of period was old corn fed on the ear, and worth 50 cents per bushel of 70 pounds. The latter part of the period was fed with green corn, as will be noticed further on. The green food fed to pens one and three was green peas, sown with oats on purpose for this work, clover and purslane. These will be mentioned along with the periods of feeding. We aimed to feed all of each food that the pigs would eat, and usually fed but twice a day, though oftener, if there was any show of hunger. The green stuff was weighed and put in a rack fastened to the side of the pen, from which the residue was weighed back when the pigs had eaten what they would. In this way we were able to tell very nearly the quantity eaten.

We had thought that green food fed in the pen with corn would probably not lessen the amount of corn eaten, but would add to the gain sufficient to more than pay its cost; also that green food of such excellent character, fed *ad libitum* in the pen, would maintain the pigs about in even flesh and permit of ordinary growth without the aid of corn or other food.

It is maintained by many that the model conditions for feeding pigs with profit is on pasture. The results of the work bear upon these points.

Weight of the Several Lots at Beginning of Test.

No. 1, 545 pounds; No. 2, 552 pounds; No. 3, 526 pounds; No. 4, 544 pounds; No. 5, 490 pounds.

These weights show them to have been a very uniform lot of pigs, except No. 5. One of this lot was rather small and accounts for the low weight. All appeared to be in healthy condition. They were put in their respective quarters July 2d and until the 30th were fed equal rations of corn, when they were reweighed and put upon the special feeding. Lot 5 is not considered in the general discussion which follows, except when especially mentioned.

Below are exhibited the results of the preliminary feeding period of eleven days. We call especial attention to these as showing conclusively that the several lots were quite evenly selected.

PRELIMINARY PERIOD—JULY 2D TO 12TH, INCLUSIVE. (11 DAYS.)

	Weight at commencement.	Weight at close.	Gain.	Corn eaten.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
No. 1	545	594	49	300
No. 2	552	602	50	300
No. 3	526	578	52	300
No. 4	544	598	54	300

The pigs all ate the same amount of corn. This was not especially desired, but as near as could be determined, they all had about what they would eat. The gain of the several lots is also very even, varying but five pounds between the extremes. Lot four, out in the pasture, took the lead in point of gain from the start, but their increased consumption of food is quite noticeable, as will be revealed in further tables. The aggregate gain during the preliminary period was 205 pounds, at a cost in corn of 5.85 pounds for each pound of increase, or four and one-tenth cents per pound. This cost was certainly above profitable production.

For convenience in noting the results of the feeding as it progressed, the time is mostly divided into periods of two weeks each, but naturally it divides itself into but two periods: First, during which dry corn was fed; second, during which green or new corn was fed.

PERIOD FROM JULY 13TH TO 26TH INCLUSIVE, 14 DAYS.

	Weight on first date.	Weight on second date.	Gain or loss+ or—.	Corn eaten.	Green food eaten.
	Paunds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
No. 1	594	640	+46	335	262
No. 2	602	666	+64	486	....
No. 3	578	520	—58	....	536
No. 4	598	678	+90	456	....

In studying the increase of weight, the amount of corn eaten should be taken into consideration. It is to be observed that pen one consumed 151 less pounds of corn than pen two, but in lieu of it ate 262 pounds of green food (peas and oats), yet the less gain would indicate plainly that this green food did not take the place of corn in producing growth. With pen two about 7.6 pounds of corn produced one pound of increase, at this rate the 335 pounds eaten by pen one should have produced a trifle over 44 pounds increase The facts are they gained 46 pounds, thus allowing two pounds for the feeding value of the peas, certainly not at all commensurate with the labor expended, growing and feeding them; comparing pen four with pen two on the same basis. they should have gained just 60 pounds, but they gained 90 pounds or one half more. Their gain being at the rate of one pound to five of corn eaten. These remarks are given as illustrating the manner in which this and subsequent statements of feeding should be studied. Pen three show an utter failure of our expectations to sustain them on green food. Pen four, it should be remembered, ate in addition to the 456 pounds of corn all the grass they chose to. The gain of this lot cost 3½ cents per pound for corn. The peas fed to No. 3 during this period were in condition to furnish the maximum quantity of green food.

PERIOD FROM JULY 27TH TO AUGUST 9TH, INCLUSIVE.—14 DAYS.

	Weight on first date.	Weight on second date.	Gain or loss + or —.	Corn eaten.	Green food eaten.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
No. 1..................	640	708	+68	447	102
No. 2..................	666	742	+76	441	....
No. 3..................	520	510	—10	....	686
No. 4..................	678	754	+76	554	....

In the above figures some of the points noted in remarks on previous period are reversed. Pen two made the best gain, but at a cost of four cents per pound, and pen four which made such a good record for last period costs over five cents for each pound of gain. Statements of cost are based simply on cost of corn. Pen three continued to decrease in weight, having lost now 68 pounds, or are 16 pounds lighter than at the beginning of preliminary period. Peas were used for the first seven days of this period and clover for the latter part. The clover was just coming into full bloom. Pen one as the record shows refused to eat much green food, and ate slightly more corn than No. 2.

The apparent contradiction in the results of the two periods illustrate the necessity of such work being conducted for a considerable length of time, and with duplicate tests for average results.

PERIOD FROM AUGUST 10TH TO 23D, INCLUSIVE,—14 DAYS.

	Weight at first date.	Weight at second date.	Gain.	Corn eaten.	Green food eaten.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
No. 1..................	708	756	48	362	225
No. 2..................	742	784	42	351	....
No. 3..................	510	518	8	....	790
No. 4..................	754	830	86	514	....

The three lots eating corn shows a decidedly poor gain for corn eaten, No. 2 being the poorest, each pound of increase with them cotsing 5.8 cents. No. 4 did the best, each pound with them costing about 4½ cents. Pen No. 3 show a small gain, their food was clover, peas and purslane, mostly the latter. The quantity consumed was considerable greater than heretofore, the purslane seeming to be especially relished. As to their slight gain, they had reached a very low ebb, and the enormous quantity of food eaten seems to have been sufficient to produce this, but all will recognize at a glance that it was totally insufficient to pay for care, no price being put upon the food.

Lot number five were weighed with the others at the close of this period as the farm were to begin feeding green corn to the herd, and we desired to know what their gain had been on pasture, with a small allowance of corn. It should be added that they had access to the cow-yards as well as the pasture, though but little grain was being fed the stock at this time.

	Weight July 2d.	Weight August 23d.	Gain.	Time.	Gain per day for each pig.
	Pounds.	*Pounds.*	*Pounds.*	*Days.*	*Pounds.*
No. 5.................	490	580	90	54	.4

These conditions it appears were sufficeint to maintain growth. The increase of weight was evidently growth of frame, not flesh.

All of the pigs were apparently in good health. The low condition of pen 3 was the result of rations fed, and did not affect their general health as is abundantly proven by statements of future periods. It was now thought best to change their rations to corn with green food as the treatment had been carried on sufficiently long to demonstrate its failure.

It was necessary to feed them only part ration of corn for first week, as their gums seemed sore, and they ate with considerable difficulty; afterwards a full ration was feed.

PERIOD FROM AUGUST 24TH TO SEPTEMBER 13TH, INCLUSIVE.—21 DAYS.

	Weight at first date.	Weight at second date.	Gain.	Corn eaten.	Green food eaten.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
No. 1..................	756	828	72	515	400
No. 2..................	784	840	56	494	....
No. 3..................	518	626	108	578	554
No.4	830	942	112	975	....

The time covered by this period is three weeks to make it end with the feeding of old corn. In fact new corn was fed Saturday and Sunday before the weights were taken Monday morning. Taking this period as a whole the gain is decidedly poor for pens one, two, and four and only fair for pen three, but we find from the data that the gain was very much better for the first two weeks of the period than for the last week.

Figures are given illustrating this. In showing the pounds of corn required for one pound of increase, no notice is taken of green food eaten as its value seems to have been small and cannot well be estimated.

	Pounds of corn consumed for one of increase, first two weeks.	Same for whole time.
	Pounds.	*Pounds.*
No. 1	5.7	7.2
No. 2	8.5	8.8
No. 3	4.1	5.4
No. 4	5.0	8.7

Why the increase should be better for the first two weeks of this period, is not explained except in case of pen three which had just been placed on corn, and very naturally made a rapid gain from their emaciated condition. This matter is brought out thus prominently to illustrate what has often been observed before in feeding, that there are periods when it is done at a considerable loss.

PERIOD FROM SEPTEMBER 14TH TO 27TH, INCLUSIVE.—14 DAYS.

	Weight on first date.	Weight on second date.	Gain.	Corn eaten.	Green food eaten.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
No. 1	828	924	96	608	180
No. 2	840	920	80	519	....
No. 3	626	744	118	782	160
No. 4	942	1050	108	832	....

The new corn was picked from the stalk and was just passing out of "the milk." It was well relished by all the pigs. In equal bulk green corn weighed about one-third more than old corn.

If the weights of corn for the above period could be reduced to an equivalent weight of dry corn, it would give better data for determining its value in the experiment. This, however, is quite impossible, as it had a constantly changing value; but if we allow 30 cents for each 70 pounds, which is a liberal estimate, it shows quite advantageously for this period, making the gain per pound for the several pens cost 2.5 cents, 2.6 cents, 2.7 cents and 3. cents respectively.

Pen three made a gain during this period of a little more than two pounds per day for each pig, the largest gain made up to this date. The green food was as for previous period, but little of it being eaten with green corn.

With the close of this period, pens one and two pass out of the experiment. The summary of their record for the entire period will appear at the close.

For the remainder of the time pens three and four are given in one period. During this period of 22 days, pen three makes a gain of almost two pounds per day for each pig, and pen four slightly exceeds two pounds per day.

PERIOD FROM SEPTEMBER 28TH TO OCTOBER 19TH, INCLUSIVE.—22 DAYS.

	Weight at first date.	Weight at last date.	Gain.	Corn eaten.	Green food eaten.
No. 3	744 lbs.	910 lbs.	166 lbs.	1,040 lbs.	380 lbs.
No. 4	1,050 lbs.	1,230 lbs.	180 lbs.	1,709 lbs.	....

The corn eaten during this period is especially heavy, but that it was new corn should be constantly borne in mind. The crop was already in shock at the close of this period, and the value of corn had considerably declined from the 50-cent basis with which it started.

The record of lot No. 5 is here presented for the period from August 24th to October 19th—56 days:

	Weight August 24th.	Weight October 19th.	Gain.	Time.	Gain per day for each pig.
No. 5	580 lbs.	902 lbs.	322 lbs.	56 days	1.4 lbs.

During this time these pigs with the rest of the herd received corn from the field in such quantities as they would eat up clean. They were fine pigs and went to the butchers on October 20th. The summary for all the pens and covering the entire time is here given.

GENERAL SUMMARY COVERING THE ENTIRE TIME OF THE EXPERIMENT.

Pen.	Weight July 2, pounds.	Weight Sept. 13, pounds.	Gain for first period, pounds.	Dry corn eaten, pounds.	Green food eaten, pounds.	Weight at close of test, pounds.	Gain for last period, pounds.	Green corn eaten, pounds.	Green food eaten, pounds.	Total corn eaten, pounds.	Total green food eaten, pounds.	Days of test.	Total gain, pounds.	Average gain per day for lot, pounds.	Average cost of gain per pound for whole time, cents.
1	545	828	283	2,150	989	Sept. 27, 924	96	608	180	2,458	1,169	88	379	4.3	4.6
2	552	840	288	2,265	....	Sept. 27, 920	80	519	....	2,484	....	88	368	4.2	4.8
3	526	626	100	878	2,566	Oct. 19, 910	284	1,822	540	2,400	3.106	110	384	3.5	3.5
4	544	942	398	2,820	....	Oct. 19, 1,230	288	2,541	....	5,061	....	110	686	6.2	4.3
5	490	Aug. 24, 580	90	....	....	Oct. 19, 902	322	....	....	....	....	110	412	3.7	....

In the values given in the foregoing statement, dry corn is rated at 50 cents for each 70 pounds, or at 7 mills per pound, and new corn is given an average value of 30 cents for each 70 pounds, or 4 mills for each pound. The values 7 and 4 mills are very near the facts, and were used in obtaining the figures given above.

A few generalizations are drawn, as follows: Pen No. 2 ate 2,265 pounds of dry corn for first period on which they made a gain of 288 pounds. This pen were fed entirely on corn, hence we can, with assurance in this case, say 7.8 pounds of corn caused one pound of increase; taking this as a standard, pen No. 1 should have produced 275.6 pounds increase. Their actual increase was 283 pounds, or 7.4 pounds in excess of the calculated yield from the supposition that 7.8 pounds of corn unaided will produce one pound of increase. This difference is so slight as to furnish no basis whatever for conclusions as to the value of the green food eaten; of which it should be remembered this pen ate 989 pounds during the period. The cost per pound of increase for this period for pens 1 and 2, estimating only corn, was 5.3 cents and 5.5 cents, respectively.

During the 42 days, from July 13th to August 23d, pen 3 ate 2,012 pounds of green food and decreased in weight 68 pounds, but regained 8 pounds just at the close, so that they then weighed 60 pounds less than when the period began. This certainly shows it to be impracticable to attempt to grow pigs on green food alone. Being well aware that pigs can be and are frequently grown quite successfully on clover pasture without other food, but to attempt to keep them in growing condition in a pen seems from our experience impossible. This pen was August 23d 8 pounds lighter in weight than when the preliminary period began July 2d.

Their treatment from August 24th to the close is fully set forth in the tables. Omitting the green food entirely from the calculation, this pen shows an average cost for pound of increase 3½ cents, the best showing of either of the four lots; this is because the corn used was principally green corn.

Pen 4 made a gain during the period fed on old corn of 398 pounds, over one hundred pounds more than either of pens 1 or 2, but it was at a cost of five cents per pound. This, however, is better than pens 1 and 2. For corn eaten, according to basis previously used in comparing pens 1 and 2, they should have made a gain of 361.5 pounds, but their gain exceeds this by 36.5 pounds. This excess is all that can be legitimately claimed as the value of the pasture.

For the period this pen were fed green corn, we have a gain of 288 pounds at a cost of 3½ cents per pound. Pen 3 gained 284 pounds on green corn at a cost of a little over 2½ cents a pound. Pens 1 and 2, for the short time on green corn, made reasonable gains at a cost of 2½ cents per pounds for No. 1, and a trifle over that for No. 2.

When the pigs went to the butcher, No. 4 was certainly as fine a lot of pigs as we ever saw, and the others were in almost equally good condition.

CATTLE FEEDING EXPERIMENT.

During the latter part of the winter and early spring of 1885 a few simple tests of feeding milch cows were undertaken. The main object being to ascertain as far as possible the effect of changing the ration, and preparing it with greater care than usual, by introducing in a systematic manner a number of the most common feeding stuffs.

The work was begun February 1st and continued until April 25th. Five ordinary grade cows of the University herd were selected for the work and placed in stalls at one side of the cattle barn. The weights of the animals were taken once a week, on Saturday afternoon, before giving the evening feed. All were watered once a day with water warmed to 55° or 60° Fahrenheit. This they took sparingly at first, but afterwards with great relish, drinking much more than the other cattle did of water from the well or brook. The cows were given two or three hours' exercise each day, except when stormy. The cows in the dairy were receiving hay in the barn, corn fodder in the yard, and corn meal with beets additional to this rough feed.

This was taken as the ration for the first period. The fodder and hay were cut to half inch lengths and the corn meal mixed with it, all being fed together in the manger. The ration was as follows:

Cut hay,	12 pounds.	Thoroughly mixed, dampened and fed in two feeds—morning and evening.
Cut corn fodder,	12 "	
Corn and cob meal,	8 "	
Sugar beets,	18 "	Fed at noon.

Taking into consideration the high feeding value of the sugar beets, as shown by the chemist's analysis, this made a very fair ration for a cow of 1200 pounds live weight. The nutritive ratio of the beets was 1 : 5.2. This is a very high feeding value for roots, being to all purposes a perfect ration for milk production.

A chemical analysis of all the feeding stuffs was not made, and the ration is not discussed as to chemical composition, but it was always brought as nearly as possible from the stuff at hand to the standard milk ration for 1200 pounds live weight, which is here given: Dry matter, 28.8 pounds; protein, 3.0 pounds; fats, .48 pounds; carbohydrates, 15.0 pounds; nutritive ratio, 1 : 5.

It was thought that the above mixture of fodder, hay, and corn would be eaten more closely, or that the rough feed at least would, and thus increase its value over the ordinary method of feeding it. But in this we were disappointed, as the cows persistently refused to eat the coarse part of the fodder, and thus a part of the meal which adhered to it was lost, as was also some of the hay.

At the end of the first week it was found impossible to run our grinder longer and corn meal (seven pounds per day to each cow) was substituted for the eight pounds of corn and cob meal. At the end of two weeks a change was made in the manner of giving the ration but the ingredients were kept about the same.

Although the ration was fed with poor success in some respects yet the cows show a slightly increased flow of milk at the close of the two weeks over the average product before the test began.

The average temperature in the barn was 26° Fahrenheit.

The following tables present the entire record for the two weeks.

FEBRUARY 1ST TO 7TH, INCLUSIVE.

No. of cow.	Weight February 1st.	Weight February 7th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*
1	1,260	1,226	—34	67	6	56	10	124	0	17	11¾
2	1,100	1,096	— 4	58	3	46	13	105	0	15	0
3	1,180	1,180	......	84	5	72	8	156	13	22	6 3-7
4	1,298	1,270	—28	45	11	39	11	85	6	12	3 1-7
5	1,080	1,036	—44	103	0	83	11	186	11	26	10 5-7

FEBRUARY 8TH TO 14TH, INCLUSIVE.

No. of cow.	Weight February 7th.	Weight February 14th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*
1	1,226	1,176	—50	67	15	56	0	123	15	17	11 2-7
2	1,096	1,090	— 6	60	4	50	1	110	5	15	12 1-7
3	1,180	1,200	+20	86	9	75	2	161	11	23	1 4-7
4	1,270	1,270	......	37	15	35	4	73	3	10	7 2-7
5	1,036	1,062	+26	92	6	87	6	179	12	25	10 6-7

The cows do not average quite 1200 pounds live weight, but come so near this figure that the ration is properly calculated on this basis.

The variation in weight of animals from week to week is quite unaccountable, but apparently influences but little the flow of milk, unless, perhaps, it should be a steady decline.

The food used in the above ration was valued as follows: Hay, $12 per ton; fodder, $5 per ton; corn, 45 cents per bushel, (ears, 68 pounds, shelled, 56 pounds); beets, 10 cents per bushel of 40 pounds.

Total product of milk, 1,306 pounds and 12 ounces.

Value, at 3 cents per pound, ...	$39 20
Cost of food and labor, ...	25 20
Balance profit on milk, ...	$14 00

This allows nothing for marketing, which is a considerable expense, and the price (3 cents per pound) is much better than is obtained, except in cities. The actual amount of food eaten cannot be given, but the valuation is made of the whole amount fed.

Beginning with the third week the ration was changed as follows:

Morning	—Cut hay, . . .	12 pounds.	Mixed together and fed damp.
	Corn meal, . .	3½ "	
Noon	—Beets, ...	18 "	Beets cut up in feed box and meal mixed with them.
	Corn meal, . .	3½ "	
Night	—Cut fodder, . .	15 "	. Fed dry.

This ration varies from the other only in quantity of fodder used and the manner of feeding it. By this method the food was eaten with good relish.

Of the coarse fodder, on an average, three-fourths of the total quantity given was consumed. The above ration was fed without change for two weeks with quite satisfactory results, except in amount of fodder eaten.

The average temperature in the barn was 22° for the first week, for second week, 34° Fahrenheit.

The following tables give the records of the cows in full for the two weeks.

FEBRUARY 15TH TO 21ST, INCLUSIVE.

No. of cow.	Weight February 14th.	Weight February 21st.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz*	*Lbs.*	*oz.*
1	1,176	1,200	+24	71	14	56	6	128	4	18	5 1-7
2	1,090	1,090	......	60	3	48	7	108	10	15	8 2-7
3	1,200	1,196	— 4	91	3	76	10	167	13	23	15 4-7
4	1,270	1,236	—34	38	9	35	13	74	6	10	10
5	1,062	1,070	+ 8	98	6	89	13	188	3	26	14 1-7

FEBRUARY 22D TO 28TH, INCLUSIVE.

No. of cow.	Weight February 21st.	Weight February 28th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*
1	1,200	1,174	—26	69	14	56	0	125	14	17	15 5-7
2	1,090	1,064	—26	60	1	47	14	107	15	15	6 3-7
3	1,196	1,198	+ 2	89	8	73	3	162	11	23	3 6-7
4	1,236	1,226	—10	35	14	33	9	69	7	9	14 5-7
5	1,070	1,038	—32	108	8	83	3	191	11	27	6 1-7

The total product of milk for these two weeks is slightly in excess of previous period, being 1,324 pounds and 14 ounces. The cost of production is a little more for the extra amount of fodder used.

Very little success attended our efforts to make the animals consume the fodder more closely, but the hay was well eaten when cut and fed with meal. On the whole the ration produced quite satisfactory results in flow of milk. The previous rations with labor cost about 36 cents per day for each cow.

Following this, an attempt was made to introduce oat straw into the ration, and still preserve its balanes by the use of more concentrated foods. This was hardly successful as it was impossible to get the cows to eat the straw, hence other food mixed with it was partially lost. The ration was arranged as follows:

Morning	—Cut oat straw	12	pounds.	Mixed and fed dampened.
	Cotton seed meal . . .	⅓	"	
	New process bran . . .	3	"	
	Ground oats	2	"	
Noon	—Sugar beats	18	pounds.	Beets cut into feed box and meal poured over them.
	Cotton seed meal . . .	½	"	
	Bran.	3	"	
	Ground oats	2	"	
Night	—Cut fodder	12	"	

Theoretically this was a good ration, but the straw was so little relished by cows accustomed to eating hay that the morning feed was partially lost, and changed after three days substituting 6 pounds of corn fodder for 6 pounds of straw, making equal amounts of straw and fodder in the morning feed, and the others remaining as above. This ration was continued for three weeks with a slight change at the beginning of the third week, substituting 2 pounds of oil meal for the 1 pound cotton seed meal. This was done because the cows were dainty about eating the cotton seed meal even in such small quantities. The oil meal (old process) was eaten better. Also the meals were fed in the morning on 6 pounds of straw, and then 6 pounds of dry fodder given afterwards. This suited the cows much better, and the product of milk rose for the last week while the temperature and general conditions were not so favorable.

The following table gives the weights, etc., for the three weeks. The average temperature in the barn was 44°, 42° and 30° Fahrenheit for the three weeks, respectively.

MARCH 1st TO 7th, INCLUSIVE.

No. of cow.	Weight February 28th.	Weight March 7th.	Increase or decrease + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*
1	1,174	1,140	—34	61	0	51	5	112	5	16	0 5-7
2	1,064	1,058	— 6	56	9	45	11	102	4	14	9 3-7
3	1,198	1,190	— 8	83	0	67	1	150	1	21	7
4	1,226	1,240	+14	33	11	32	6	66	1	9	7
5	1,038	1,040	+ 2	93	2	76	8	169	10	24	3 5-7

MARCH 8th TO 14th, INCLUSIVE.

No. of cow.	Weight March 7th.	Weight March 14th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	lbs.	*lbs*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*
1	1,140	1,140	....	63	4	50	14	114	2	16	4 6-7
2	1,058	1,102	+44	58	1	45	8	103	9	14	12 5-7
3	1,190	1,240	+50	79	11	64	13	144	8	20	10 2-7
4	1,240	1,292	+52	32	14	29	14	62	12	8	15 3-7
5	1,040	1,058	+18	89	9	74	3	163	12	23	6 2-7

MARCH 15TH TO 21ST, INCLUSIVE.

No. of cow.	Weight March 14th.	Weight March 21st.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	lbs.	*lbs.*	*lbs.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*
1	1,140	1,180	+40	64	14	52	14	117	12	16	13 1-7
2	1,102	1,094	— 8	58	3	45	9	103	12	14	13 1-7
3	1,240	1,234	— 6	88	0	71	11	159	11	22	13
4	1,292	1,306	+14	32	0	28	12	60	12	8	10 6-7
5	1,058	1,056	— 2	89	0	72	14	161	14	23	2

The total product of milk was as follows: First week, 600 lbs , 5 oz., a marked decline; second week, 588 lbs., 11 oz.; third week, 603 lbs., 11 oz. The better results of the last week were doubtless due in part to the increase of oil meal over cotton seed meal, and the manner of giving the ration, as there was no refuse when the meals were fed on 6 pounds of straw alone. The 6 pounds of dry fodder fed afterwards was also eaten quite well. The ration for the past three weeks with labor cost but little more than the previous one, being 36 to 40 cents for each cow. In this work the allowance for labor is 15 cents per day for each cow, which is much larger than actual cost would be in an ordinary dairy. During the summer a quantity of oat hay had been made in order to have a sample for analysis, and also to observe whether stock would eat it with relish. This was weighed, and it was ascertained that there was enough to feed the five cows for one week, hence a ration was arranged as follows:

Cut oat hay, ...	12 pounds.	All mixed, dampened, and fed in two feeds, morning and evening.
Cut oat straw, ...	12 "	
Oil meal, ...	2 "	
Bran, ...	6 "	
Ground oats, ...	4 "	
Sugar beets, ...	18 "	At noon.

This ration was well eaten, very little being left as refuse. It was not fed long enough to practically observe its effect on the flow of milk, but from the appearances we would judge oat hay to be a valuable fodder and easily grown to supplement the hay. The value of the straw is a question of considerable doubt; while it was well eaten with equal quantities of oat hay, the flow of milk fell to the lowest point yet reached.

MARCH 22D TO 28TH, INCLUSIVE.

No. of cow.	Weight March 21st.	Weight March 28th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz*	*Lbs.*	*oz*	*Lbs.*	*oz.*
1..............	1,180	1,206	+26	64	3	53	0	117	3	16	11 6-7
2..............	1,094	1,086	— 8	52	10	42	13	95	7	13	10 1-7
3..............	1,234	1,240	+ 6	79	8	70	5	149	13	21	6 3-7
4..............	1,306	1,310	+ 4	29	10	27	0	56	10	8	1 3-7
5..............	1,056	1,084	+28	83	14	78	9	162	7	23	3 2-7

The total product of milk for the week was 581 pounds, 8 ounces. Average temperature in the barn, 38° Fahrenheit.

This ration could not be continued longer for want of oat hay.

It was now intended to arrange a ration, the coarse feed of which should be clover hay, but it was impossible to get a good sample, so this had to be abandoned after one week's trial.

The ration, as arranged, was:

Cut clover hay, . . . 20 pounds.
Corn meal, ... 7 "
} Fed in two feeds, morning and evening, with 18 pounds of sugar beets at noon.

The cows could not be induced to eat the poor hay and a different ration was arranged. The record of the work is given, however, to avoid a break in the data.

MARCH 29TH TO APRIL 4TH, INCLUSIVE.

No. of cow.	Weight March 28th.	Weight April 4th.	Increase or decrease. + or —.	Total weight of milk.		Weight of milk.				Average daily product.	
						A. M.		P. M.			
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz*	*Lbs*	*oz*	*Lbs.*	*oz.*
1..............	1,206	1,220	+14	62	6	52	14	115	4	16	7 3-7
2..............	1,086	1,094	+ 8	49	13	40	6	90	3	12	14 1-7
3..............	1,240	1,256	+16	81	6	69	5	150	11	21	8 3-7
4..............	1,310	1,332	+22	29	11	25	15	55	10	7	15 1-7
5..............	1,084	1,086	+ 2	82	12	78	0	160	12	22	15 3-7

The total weight of milk was 572 pounds, 8 ounces. The cost of the ration for each cow per day was 14 to 16 cents, not including care.

A ration was now arranged, which, for nutritive value, exceeded any yet fed, but the sugar beets were omitted from it. It was as follows:

Cut timothy hay, . . 18 pounds.
Ground wheat, . . . 8 "
Oil meal, ... 2 "
} Mixed and fed in two feeds, in the morning and evening.

The hay was excellent. The wheat had been injured in storage, yet the feeding value was not materially affected.

Omitting the beets left the cows without a noon feed, and a small quantity of the ration was placed in the box at noon in lieu of the beets. After the first week the wheat was increased to 10 pounds per day. The cost of this ration was 28 to 30 cents, not including labor. It was fed for three weeks and eaten with great relish by all the cows. The detailed results are set forth in the following table:

APRIL 5TH TO 11TH, INCLUSIVE.

No. of cow.	Weight April 4th.	Weight April 11th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*
1	1,220	1,172	—48	60	14	51	4	112	2	16	0 2-7
2	1,094	1,050	—44	52	3	43	9	95	12	13	10 6-7
3	1,256	1,242	—14	74	12	65	1	139	13	19	15 4-7
4	1,332	1,300	—32	27	8	25	7	52	15	7	9
5	1,086	1,090	+ 4	87	5	80	0	167	5	23	14 3-7

APRIL 12TH TO 18TH, INCLUSIVE.

No. of cow.	Weight April 11th.	Weight April 18th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*
1	1,172	1,176	+ 4	59	10	49	10	109	4	15	9 5-7
2	1,050	1,048	— 2	50	7	42	6	92	13	13	4 1-7
3	1,242	1,248	+ 6	73	4	63	0	136	4	19	7 3-7
4	1,300	1,310	+10	25	11	23	14	49	9	7	1 2-7
5	1,090	1,100	+10	88	12	79	8	168	4	24	0 4-7

APRIL 19TH TO 25TH, INCLUSIVE.

No. of cow.	Weight April 18th.	Weight April 25th.	Increase or decrease. + or —.	Weight of milk.				Total weight of milk.		Average daily product.	
				A. M.		P. M.					
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*	*Lbs.*	*oz.*
1	1,176	1,184	+ 8	57	11	51	9	109	4	15	9 5-7
2	1,048	1,056	+ 8	50	7	47	0	97	7	13	14 5-7
3	1,248	1,254	+ 6	69	10	63	8	133	2	19	0 2-7
4	1,310	1,306	— 4	25	3	24	10	49	15	7	1 6-7
5	1,100	1,090	—10	88	2	82	1	170	3	24	5

The total product of milk was, for the three weeks respectively, 567 pounds, 15 ounces, 556 pounds, 2 ounces and 559 pounds, 15 ounces.

It was expected that this ration would under the favorable conditions of mild weather produce a better flow of milk than the above showing. It suggests that the value of beets in a ration for milk production is much greater than their estimated feeding value.

The above ration was sufficiently high in nutritive value to have maintained a full flow of milk, unless there were attributed special value to the beets as milk producing food. Analyses of the corn fodder, oat straw and oat hay used in the above work will be found in the report of the chemist.

The foregoing work based on an attempt to so manipulate the common coarse foods, and by-products, as to make a complete ration from them leads to the following conclusions. That coarse heavy corn fodder cannot safely be mixed with meals or concentrated foods as loss from the refuse not eaten is quite sure to result. The smaller portion of the stalks and the leaves are well eaten and their value would be materially enchanced if they could be separated from the coarser portion.

It is very desirable to feed the concentrated foods with the coarser as this secures better digestion by insuring remastication. Possibly if the whole mass could have been steamed it would all have been eaten. This we were not prepared to test. It seems evident that straw, though it can be so managed that stock will eat it is detrimental to a milk ration.

There is no doubt that beets have a much greater value in a milk producing ration than their estimated feeding value would indicate. Of these, Lane's Imperial Sugar beet seems to be one of the best. Over 20 tons of this variety have been grown per acre here. Warmed water for milch cows apparently adds to the general conditions of success, and aids digestion by preserving the stomach from the shock caused by drinking cold water. Much more water is taken when warmed than of cold. In arranging a ration the first thing to be sought is not what foods will furnish the ingredients, theoretically necessary, but what will furnish them at least cost in a practicable form for feeding.

SOILING CATTLE.

Six cows were selected from the farm herd in August, and for a little over one month so handled as to test the value of soiling for cows. Three of the cows were kept in a closed yard where they were fed three times a days such quantities of green food as they would eat, the other three were left with the dairy herd on excellent green clover pasture.

The condition of the herd for good results could not have been bettered, hence it was a favorable time to compare their results with stock fed in the yard.

The following table presents in a brief, comprehensive view the milking records of the cows. The time is divided into several periods, and these are not of equal length, but the number of days for each period is given, and the averages per day for each period also, from which all comparison must be made.

Cows one, two, and three were fed in yard, and numbers four, five, and six were with the herd in pasture.

The animals selected were all good, fair milkers, common stock and grade animals. Those kept in the yard show from the first a less total yield of milk than those in the pasture. The comparison, however, is not based on total yield, but on the ability of each cow to maintain her daily average up to the amount she was giving at the beginning of the test.

	Cow No. 1.								Cow No. 2.								Cow No. 3.								Green food eaten.	Av. weight of green food given each cow per day.
	Milk.								Milk.								Mi'k.									
	A. M.		P. M.		Total.		Average per day.		A. M.		P. M.		Total.		Averave per day.		A. M.		P. M.		Total.		Average per day.			
	lbs.	*oz.*	*lbs.*	*oz*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz*	*lbs.*	*oz*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*lbs.*
August 18th—24th, inclusive—7 days	55	11	69	8	125	3	17	14⅛	82	12	89	15	172	11	24	10⅝	83	12	96	14	180	10	25	13	*1679	133
August 25th—30th, inclusive—6 days	44	11	47	6	91	1	15	3	67	12	73	11	141	7	23	9⅙	78	8	79	1	157	9	26	4⅙	2642	146
September 1st—5th, inclusive—5 days	38	2	47	2	85	4	17	1	61	9	49	1	110	10	22	2	74	12	71	1	145	13	29	2⅗	2254	150
September 7th—14th, inclusive—8 days	59	1	57	5	116	6	14	9	81	8	83	11	165	3	20	10⅜	110	6	115	12	226	2	28	4¼	4260	†177
September 16th—19th, inclusive—4 days	25	0	27	13	52	13	13	3¼	38	6	41	8	79	14	19	15½	45	9	59	4	104	13	26	3¼	1322	110

	Cow No. 4.								Cow No. 5.								Cow No. 6.							
	lbs.	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*	*lbs.*	*oz.*
August 18th—24th, inclusive—7 days	80	3	80	8	168	13	24	2	147	9	119	15	267	8	38	3⅜	105	12	83	7	189	3	27	½
August 25th—30th, inclusive—6 days	78	4	73	37	151	7	25	4	117	10	100	7	218	1	36	5½	93	2	74	14	168	0	28	0
September 1st—5th, inclusive—5 days	72	6	64	7	136	13	27	6	107	8	86	6	93	14	38	12⅓	83	5	63	1	146	6	29	4½
September 7th—14th, inclusive—8 days	107	13	97	1	204	14	25	10	161	12	130	14	292	10	36	9¼	118	9	103	12	222	5	27	12⅝
September 16th—19th, inclusive—4 days	51	5	49	11	101	00	25	4	77	13	64	13	141	10	35	6½	64	8	46	14	111	6	27	13½

*1122 pounds was millet, all the rest was fodder of sowed corn. † The amount of green food was increased until this period, when it was evident the cows were wasting it.

The figures in the column of averages of the above table shows the following facts: that cows feed in the yard decreased in the flow of milk during entire period just three pounds on a general average of daily product, and that cows on pasture decreased four and a half ounces on general average during the entire period. Certainly not a bad showing for soiling.

The yard in which the cows were kept is a dry, straw yard devoid of shelter of any kind from storm or sun, and they were ill at ease under these conditions, while the cows at large in the pasture enjoyed the most perfect contentment. An examination of the individual records will be found interesting.

The millet was fed but for the one period. It was in full bloom at the time. The cows wasted it more than they did the green fodder. The fodder was sowed corn, and was coming in tassel when we began to feed it. There were several plots of it sowed at different times, so that it was not fed at all after it got beyond full tassel.

The green millet yielded at the rate of 12,800 pounds per acre, and the green sowed corn 34,000 pounds per acre.

The old system of pasturing is not consistent with an advanced and progressive agriculture, and the time is not far distant when nearly all the food of cattle will, in the State of Ohio, be cut and fed to them. It is perfectly safe to say that almost any farm within the borders of our State will carry twice as much stock if this latter plan was pursued. A general change from pasturing to soiling would double the gross receipts, and would add largely to the net income of many a stock and dairy farmer. To allow cattle to run at large over good meadow land is wasteful, and unthrifty and improvident. Half the number of acres will feed the same amount of stock, and keep them in better condition if the product be cut and placed before them.

Rye, orchard grass, clover, millet, sowed corn, sorghum, and other crops can be cheaply and profitably grown, for the purpose, and each fed in its season.

With a good one-horse mower and cart one man can easily cut and feed the daily ration of a herd of twenty head in an hour's time.

Fencing is one of the heaviest taxes the average Ohio farmer has to pay. It is mainly self-imposed, and in most cases needless, but it is the necessary consequence of a radically wrong system.

REPORT OF THE HORTICULTURIST.

EXPERIMENTS WITH SMALL FRUITS.

The only fruit plants in bearing on the Station's grounds are strawberries and raspberries, except a few well known varieties of gooseberries, currants and cherries. A vineyard has been planted, but the vines were severely injured by the cold, and bore but little fruit. Several varieties of apple and pear trees are just coming into bearing. Some of the latter are to be top-grafted with new varieties the coming spring.

Especial efforts have been made to secure new varieties as soon as introduced, and a considerable number have been obtained before they were offered for sale. Originators of fruits usually seem to be quite willing to send new varieties here for trial, and in some cases express the desire to have their productions fully and thoroughly tested before offering them to the public. Originators of new varieties seldom receive adequate compensation for their labors, but they rarely, and perhaps never, try to impose upon the public by sending out varieties that are known to be worthless. That their productions do not always prove to be valuable is usually a source of greater disappointment to them than to the public. If they were able to have their new sorts thoroughly tested, and the worthless ones rejected, it is safe to say that the majority of the originators would gladly avail themselves of the privilege. On the other hand, dealers seldom manifest much interest in having their new sorts tested, for the reason that the decision comes too late to benefit them. They usually have such sorts in their possession for a very limited time before offering them for sale, and when once put upon the market there is no time for a test to be made, as the stock must be sold in a short time. This accounts for the unseeming haste in pushing new sorts regardless of their value. A trial of a variety after introduction may benefit the public, but is usually of little interest to the dealers. If, however, varieties could be tested while in the hands of the originators, dealers would be quite as much interested in the results as is the public. It would tend to lessen the number sent out, but increase the chances of profitable sale.

The Station is ready to co operate with originators in this work. Varieties will be taken on trial, and reported upon to the owner from time to time, but no report will be made public, except at the option of the owner, until offered for sale. Plants sent here for trial are not disposed of in any way, nor are they propagated except for experimental purposes. Old sorts are planted along side the new for comparison; treated and reported upon in the same manner. This doubtless is the only rational method that can be pursued, although it necessitates the growing of many kinds that have been fully tested and whose merits are well known.

STRAWBERRIES.

The soil upon which the plants were grown is a clay loam, sufficiently rich to produce a fair crop of corn without the use of fertilizers. One bed was planted in the spring of 1883, and bore a crop the following season; hence, the crop of 1885 was the second. The runners had been allowed to take root, forming matted rows. No cultivation was given, but the weeds were removed by hand-pulling and cutting with the hoe. Another bed, of the same and a number of new varieties was planted on similar soil in another field in the fall of 1884. No runners were allowed to take root. Both beds were mulched with wheat straw in the fall of 1884. This material was allowed to remain on the beds, being merely parted over the rows in the spring to permit the plants to come through. Two other beds, planted with the leading varieties, were also in bearing. These several beds in fruit at the same time gave opportunities for comparison, and served as a means to check errors that might have occurred had the notes been taken from one bed alone.

The season was unusually favorable, the rainfall in June being 4.84 inches. During the same period in 1884 it was only 1.11 inches. This difference in the rainfall of the two seasons will account for some of the discrepancies that occur in the reports. The disagreements are, however, by no means as great as might be expected, and are confined mostly to the variable or unreliable varieties.

Comparative Time of Blooming and Ripening of Fruit.

Table I. gives the dates of first appearance of bloom, the first ripe fruit, and the last ripe fruit; also, the number of days in bearing of the newer and many old varieties. This is a comparative showing, merely, as the actual time of blooming and ripening varies with the locality and from year to year in the same locality. The difficulty in making such tables exists in the fact that a few blossoms or a few ripe berries may often be found several days before any number appear, hence some of the dates given are approximations, within, perhaps, a day or two of the actual time. This does not, however, greatly impair the usefulness of the table. It will be especially valuable for the purposes of selecting varieties for a succession of fruit and in showing what perfect and imperfect flowering sorts bloom at the same time.

Relatively, the table agrees very closely with that given last year, the most notable exception being the difference in length of time in bearing of some varieties. This is due largely to the favorable season. Doubtless a mean would more nearly represent the truth. It will be noted that those varieties that have proved to be the most reliable in all sections are those that have the longest season. Possibly there are a few exceptions to this rule, but it is safe to say that no variety having an extremely short season has proved to be desirable, and the best are found among those having a long season.

Imp. is used to designate those varieties that have abortive stamens, the anthers of which contain little or no pollen. P. designates those having perfect flowers.

TABLE I.—DATE OF FIRST BLOOM AND OF FIRST RIPE FRUIT.

Name of variety.	First appearance of bloom.	First ripe fruit.	Last ripe fruit.	No. of days in bearing.
Alpha, P	May 10	June 2	June 25	23
Atlantic, P	14	8	25	17
Arnold's Pride, P	13	5	......	......
Bidwell, P	12	8	June 27	19
Black Giant, P	18	8	......	......
Captain Jack, P	12	9	July 2	21
Cornelia, Imp	18	15	10	25
Cumberland, P	15	8	4	26
Champion, (Windsor Chief) Imp	16	6	2	26
Charles Downing, P	14	6	2	26
Crescent, Imp	10	2	1	29
Daniel Boone, Imp	14	5	June 25	20
Daisy Miller, P	14	8	......	......
Emerald, P	14	10	......	......
Early Canada, P	10	2	June 27	25
Endicott Seedling, P	14	8	27	19
Finch, P	12	8	July 1	23
Ford's Seedling, P	15	6	1	25
Gypsy, Imp	12	6	1	25
Golden Defiance, Imp	16	10	......	......
Hart's Minnesota, P	12	10	July 6	26
Hovey, Imp	16	12	......	......
Indiana, P	14	6	......	......
Jersey Queen, Imp	16	9	July 6	27
James Vick, P	12	6	June 25	19
Jewell, Imp	16	6	......	......
Kentucky, P	18	15	July 10	25
Lacon, P	12	9	1	22
Miner's Prolific, P	12	6	1	25
Manchester, Imp	13	8	1	23
Mt. Vernon, P	16	11	6	25
Maggie, P	12	12	1	19
Mrs. Garfield, P	14	8	June 27	19
New Dominion, P	12	8	July 1	23
Norman, P	12	5	June 27	22
Oliver Goldsmith, P	14	8	27	19
Old Ironclad, P	12	5	27	22
Photo, Imp	14	2	July 1	29
Prince of Berries, P	18	12	4	22
Piper's Seedling, P	10	6	June 25	21
Parry, P	13	3	......	......
Ray's Prolific, P	15	5	July 4	29
Russell's Advance, P	18	12	10	28
Sucker State, P	16	11	8	27
Sharpless, P	14	8	2	24
Vineland, P	14	8	......	......
Wilson, P	14	5	June 27	22
Woodward, P	12	10	July 1	21

Comparative Size of Berries of Different Varieties.

Very careful and full notes were taken on the size of berries of all varieties, with a view to obtaining trustworthy means of comparison. No effort has been made to select the largest specimens possible, but rather to take an average size. At each picking ten or more berries of about an average size were weighed and measured.

Table II. is made up by taking an average of these weights and measurements and doubtless represents a fair comparison of varieties, but should not be taken as an index of what any particular variety may do under more favorable circumstances. With few exceptions, however, the showing is about as good as may be expected under ordinary cultivation. Cumberland, Downing, Jewell, Sharpless, and Champion would probably make a better showing in most seasons.

They certainly do not appear to as good advantage as they have been made to do elsewhere. The Sharpless and Downing never have done well here. The plants of the Jewell were set the fall previous and the plants bore too heavily to perfect the crop, which reduces the average. The berries of the Cumberland and Champion were from old beds. The Crescent apparently stands too high, but the notes are given as taken. On the whole, the table doubtless represents with considerable accuracy the average size for the whole season.

TABLE II.—COMPARATIVE SIZE AND WEIGHT.

Name of variety.	Weight of 100 berries.	Average diameter.
	Ounces.	*Inch.*
Atlantic	25.	7–8
Arnold's Pride	21.25	15–16
Alpha	23.75	1
Bidwell	26.25	1
Black Giant	25.	1 1–8
Crescent	30.	1 1–4
Columbus Wilson	20.	1
Captain Jack	22.25	1 1–16
Cornelia	28.	1 1–12
Cumberland	32.	1 3–8
Champion (Windsor Chief)	22.	1
Chas. Downing	30.	1 1–4
Daniel Boone	20.	15–16
Early Canada	20.	1
Emerald	25.	1
Finch	25.	1 1–8
Gypsy	20.	1
Golden Defiance	26.25	1 1–4
Grand Duke	10.	5–8
Hart's Minnesota	27.	1 1–8
Huddleston's Favorite	25.	1
Indiana	22.5	7–8
Jersey Queen	40.	1 1–3
Jewell	40.	1 2–5
James Vick	18.	7–8
Kentucky	32.	1 1–4
Lacon	29.	1 1–5
Mrs. Garfield	10.	9–16
Maggie	28.	1 1–4
Miner's Prolific	35.	1 1–5
Mt. Vernon	25.	1 1–16

TABLE II.—Continued.

Name of variety.	Weight of 100 berries.	Average diameter.
	Ounces.	*Inch.*
Manchester	31.	1 1-8
Norman	26.25	
New Dominion	18.	1
Oliver Goldsmith	22.5	1 1-8
Old Iron Clad	27.5	1 1-4
Prince of Berries	25.	1 1-8
Piper's Seedling	25.	1 1-16
Piloto	25.	1 1-4
Parry	25.	1 1-16
Pantuxet	25.	1
Primo	25.	1 1-16
Ray's Prolific	22.5	1 1-8
Russel's Advance	33.	1 1-4
Satin Gloss	18.	15-16
Sharpless	36.25	1 1-4
Sucker State	30.	1 1-5
Vineland	28.	1
Woodward	23.	1

NOTES ON VARIETIES.

It seems unnecessary to give detailed descriptions of varieties, except those that were not mentioned last year. A number of varieties not yet offered for sale are on trial, but it is not thought best to give an account of them until they are introduced.

Many of the statements may appear to be of local interest merely, but they will at least be useful in all sections to serve as comparisons. In some sections the rust is less troublesome than here, but as it is likely to appear in any locality, in favorable seasons for its development, some notes are given concerning varieties that are subject to it. It appeared much worse on an old bed, where the mulch was allowed to remain during the previous summer, than upon beds where the straw was removed and the ground cultivated.

Alpha.—This variety has been retained for comparison, because of its earliness. The foliage is usually quite vigorous and healthy, but last season it rusted considerably, and many of the berries did not mature. It is but little, if any, earlier than the Crescent, and much less productive, while the berries are no larger. There is no reason for retaining it longer.

Atlantic.—Appears to have no qualities that make it worth retaining on the list. Although the fruit is bright and glossy, the large calyx renders a box of the berries rather unattractive. The plants are healthy but unproductive; hence, it cannot become a profitable variety.

Arnold's Pride.—Plants quite vigorous, slightly affected by rust, unproductive. Further trial may show that this variety has some good qualities, but at present it seems likely to be dropped from the list.

Bidwell.—This variety has been on trial long enough to establish the fact that it is unworthy of cultivation. Reports concerning it from nearly all sections are unfavorable. The plants have a tendency to overbear, hence many of the berries are small and do not mature, and present a seedy, unattractive appearance. The berries color slowly and often rot before fully mature. When left about a week without picking, about one-half of the fruit was found to have rotted.

Big Bob.—Although this variety did much better than in 1884, the verdict given then cannot be reversed. It has not sufficient merit to be retained.

Charles Downing—In many localities this is a deservedly popular variety. The only reason for its partial failure here is because the plants are much affected by the rust. Where the rust is not troublesome it may be classed as one of the most profitable sorts.

Captain Jack.—In some sections this is regarded as a good variety to plant with the Cresent, but there are others that furnish as much pollen and far better fruit. The plants rust badly, the fruit is small and of poor quality. It is not deserving of further trial.

Cornelia—Has all the merits that have been claimed for it, as to size of fruit and lateness, but the plants are somewhat lacking in vigor and productiveness. The fruit is firm and keeps a long time on the vines. With rich soil and good cultivation this may prove to be a very profitable late variety.

Crescent.—Still maintains the reputation of being the best market variety. In localities where the strawberry does exceptionably well, and near markets where large berries are demanded at paying prices, it may not be the most profitable sort to grow, but the fact that under unfavorable circumstances it will yield a good crop when most other varieties fail, makes it deservedly popular. It will not only succeed where most others fail, but will respond more readily and certainly to good treatment than almost any other sort. The average size of the berries as shown by measurements taken at every picking throughout the season is but little less than that of some of the varieties that have a reputation for large berries. The fruit lacks in firmness and quality, hence a variety without these failings, and as productive and sure as the Crescent, is much to be desired.

At present the most important question with most small fruit growers is what perfect flowering sorts to plant with it to furnish pollen. As may be seen by reference to table I, there are several early blooming sorts, of which Alpha and Early Canada are perhaps the best. Only a few plants of these will be required. The best variety on the list is probably Miner's Prolific which blooms quite early. It is doubtless well to plant also some of the later flowering varieties, such as Chas. Downing, Kentucky, Sharpless and Sucker State.

Cumberland.—The plants are healthy and vigorous, but quite unproductive. Rows alongside the Crescent yielded less than one-fourth as much fruit as that variety. As a market sort it can only be profitable where good prices can be realized for fine berries. For home use it is unexcelled. The berries are large, easily picked and of good quality. Amateurs will find this one of the most satisfactory sorts to plant.

Champion (Windsor Chief).—A profitable variety in this and many other sections. The plants are healthy and productive; fruit of good size and fine appearance, but rather soft; quality medium. Well suited for near market. Plants received from A. M. Purdy were mixed with an inferior staminate variety, but those from Matthew Crawford were wholly pistillate. The fact that many spurious plants have been sent out doubtless accounts, in part at least, for conflicting reports.

Daniel Boone.—In 1884 this variety gave indications of being very promising, but the past season under more favorable circumstances it did not do nearly so well. The plants are healthy and fairly vigorous, but apparently unproductive.

Daisy Miller.—Was fruited from fall set plants only. The growth of the plant was feeble, while the fruit was very small and inferior. It seems to possess no qualities that should entitle it to further notice.

Emerald.—Fall set plants made a fair growth, and produced a number of medium sized berries of quite good quality. Further trial is necessary before a verdict as to its merits can be given.

Early Canada.—The berries are smaller than the Crescent and ripen no earlier. The plants are only moderately productive. Does not possess sufficient merit to be retained.

Finch.—Where the Manchester succeeds, this is a good variety to plant with it as a fertilizer. The berries are of good size and have a fine appearance. The flowers furnish a large amount of pollen. Were the plants somewhat more productive it would be one of the leading varieties.

Ford's Seedling.—A new variety to be sent out next season. The plants resemble those of the Chas. Downing, having somewhat of the same tendency to rust, but apparently in a less degree. In productiveness, size and appearance of fruit it is equal and perhaps excels that well known variety. It will doubtless prove to be an acquisition.

Gypsy.—The very regular and even size and good quality of the fruit render this a very excellent sort for home use. The plants are very dwarf n habit, but healthy and quite productive.

Hart's Minnesota.—This variety has many good qualities, but is perhaps lacking in distinctive characteristics. The plants are healthy, vigorous, and fairly productive; fruit medium in size and of fair quality, but rather soft. There are doubtless too many varieties of this class that have no serious faults, yet lack in qualities that make them conspicuous.

Indiana.—Fall set plants bore a few berries of medium size. Judging from its behavior here it can hardly be classed among the promising sorts.

Jersey Queen.—Where extra fine berries are desired, this variety may be recommended. It is somewhat more productive than the Cumberland, but not enough so to make it profitable in all section. It is, perhaps, better suited for amateurs than for commercial growers.

James Vick.—One-half of the berries on old plants did not mature. Upon young plants grown in hills the fruit was of medium size, firm, and of fair quality. Owing to the small size of the berries this variety will not give satisfaction if grown in matted rows. It will do somewhat better in hills, but there are so many better sorts that there is no use of retaining it longer.

Jewell.—Plants set in the fall of 1884 made a good growth, wintered well, and bore a fair crop. The plants are vigorous, healthy, and apparently quite productive. The berries are of large size, good color, quite firm, and of fair quality; sometimes irregular, but not unsightly. One season's trial is not enough to enable us to give a verdict concerning a variety, but the indications are that the Jewell is worthy of all the praise it has received.

Kentucky.—This well known variety is still a favorite in many sections. It is doubtful if any of the recently introduced sorts are likely to rival it for lateness, with the possible exception of the Ohio, which is mentioned in the proper place.

Lacon.—The plants are remarkably vigorous and productive, but showed some tendency to rust last season. The berries are soft and quite irregular, and are borne on short stems near the ground, making them difficult to pick. Although possessing many good qualities, this variety is not likely to become popular.

Miner's Prolific.—Although not new, this variety is not so well known as it ought to be. The plants are vigorous, healthy, and productive; fruit of good size, regular in shape, has a rich, glossy appearance, and is of excellent quality. For home use it stands at the head of the list. As a market sort it has two faults: First, the berries are rather soft, but are sufficiently firm to ship short distances; second, they do not always color well. There are no green tips; as with some sorts, but the under side of the berries is often white, which necessitates care in picking and packing. The white part is not objectionable to the taste, being quite as sweet as the colored portion, but may deceive buyers. Where the Downing fails because of the rust the Miner may be planted to fill its place.

Mrs. Garfield.—No better report can be made of this sort than was given last year. The plants are not sufficiently vigorous and are quite unproductive. Reports concerning it from other sections are generally unfavorable.

Mt. Vernon.—Seems to be somewhat variable, doing well in some localities and in some seasons, but not in all. The plants grow well here but are unproductive.

Norman.—Doubtless deserves more favorable recognition than it has received. The plants are healthy, vigorous, and quite productive. Fruit above medium size, of good flavor, and fine appearance. For market it may not prove as profitable as some other sorts, but for home use it will be found to be desirable.

Nigh's Superb.—Unworthy of further trial.

Old Ironclad.—Conflicting reports are given concerning this variety, some growers giving it high praise, others condemning it as worthless. In 1884 it was unsatisfactory here but quite the reverse the past season. It probably can not be relied upon to give uniform results from season to season in any locality, although it may do better in some than in others. Its greatest fault seems to be overproductiveness, in consequence of which many of the berries are small and imperfect. In the fall of 1884 the plants bloomed quite freely, but the blossoms were all killed; in consequence the number of berries in 1885 was lessened but the crop was improved. Whatever may be said in favor of this variety, it must be classed as variable, hence not safe to plant in any quantity.

Ohio—A variety soon to be introduced. It is a seedling of the Kentucky, which it resembles in habit of growth and appearance of its fruit, but the flowers are imperfect. The season is the same. The plants are perhaps rather more vigorous than those of the parent variety and much more productive. The foliage rusted slightly but not seriously. Probably this will take rank as one of the best late sorts.

Piper's Seedling—Vigor of plants, abundance of bloom, and good size of fruit are qualities which this variety possesses in a marked degree, but yet it is unproductive. The promise of a bountiful crop at the beginning of the season is flattering but after two or three pickings the berries diminish in size rapidly and ripen quickly, thus the season is short and the yield light. This peculiarity was quite as marked in the past favorable season as in the previous dry one. The same complaint concerning this sort is feared from other sections, hence it cannot be recommended.

Prince of Berries.—Plants healthy and fairly vigorous, but quite unproductive here. Fruit ranks first class as to quality. For amateurs this is a desirable variety, but in most sections and under ordinary cultivation would not prove to be profitable for commercial growers.

Parry.—Plants set in the fall of 1884 grew finely, wintered well, and bore a good crop. The berries are large, firm, and of good quality. This is a promising variety and will undoubtedly take a high rank.

Photo.—This gave some of the finest berries that grew on the Station grounds. For amateurs it is a fine sort. The plants are not sufficiently vigorous and productive for general cultivation, while the berries color rather unevenly and do not keep well on the vines. The foliage is also somewhat inclined to rust.

Ray's Prolific.—Gave better results than in 1884. Some of the berries were

very fine. Plants lacks in vigor and productiveness, hence the variety is not to be recommended.
of the Cumberland, while the plants are quite as vigorous and much

Sucker State.—In size and appearance the berries are nearly equal to those more productive. This variety appears not to have received the attention that it deserves. Reports concerning it are favorable from nearly all sections and the indications are that growers would do well to plant it largely.

Sharpless.—This continues to be a favorite in some sections, but in others it is discarded. It should not be planted in localities subject to late spring frosts as the buds and blossoms are very tender. Unless grown with the best of care and under proper conditions the berries average but little larger than those of the Crescent, but when the conditions are favorable the berries are the largest and sell the highest of any that we offered in the market. This must be classed with the variable, uncertain varieties, and should be planted only where it is known to flourish.

Wilson.—This once popular variety is said by many to have run out, but the fact that it is still planted largely in many sections seems to be against the theory. The plants are considerably affected by the rust here and in many other sections where they flourished only a few years since, but they are not attacked as badly as many of the newer varieties. Probably the true explanation of the failure of the Wilson is that the rust is more prevalent than formerly. There is no doubt that it may still be grown with profit when the rust is not troublesome.

Wonderful.—Was sent out as a new variety last season, but it is unquestionably the Champion.

The following varieties were planted in the spring of 1885 and fall of 1884. Many of them have not been offered for sale. A few that were sent out in 1884 and appear in the list have not fruited sufficiently to warrant giving a report concerning them: Hathaway's, Nos. 3, 5, 8, 9, and 45, Foote's Seedling, Queen of the Peninsula, Mammoth Beauty, Dimondale, Gardener's Colossal, Kennedey's Seedling, Farnsworth, Connecticut Queen, Bancroft, Covill's Early, Garretson, Ontario, May King, Kruschkee's Nos. 1, 2, and 3, Amateur, Excelsior, Jessie, Bonanza, Crawford's No. 6, Henderson, Countess, Ellisdale, Parker Earle, Woodruff No. 1, Trowbridge, Bubach's No. 5, Lida, Sunapee, Montreuil, Royal Hautbois, Belle Bordelaise.

Some of the above are very promising, judging from the healthy foliage the few berries that were allowed to mature.

Effects of Mulching.

The observations made in 1884, with thermometers placed over the bare ground and over straw, were repeated. The same general results were obtained. There can be little doubt that the temperature is lower and frost is more likely to occur where the ground is mulched than where it is left uncovered. This principle has long been known and applied in India. Pits are there dug and filled with straw to the depth of about two feet. Basins, filled with water, are placed on the straw in the evening, when the wind is from a northerly direction. The cold produced in this manner is sufficient to form ice when the conditions are favorable. It seems that the same principle holds good upon a field mulched with straw, although the cold produced is by no means as great as over greater depths of straw. The object of the observations was to ascertain if the increased danger from mulching was sufficient to warrant the removal of the material during the time of bloom.

The data obtained are insufficient to answer this question but the indications are that the danger of frost is only slightly greater over mulched than over unmulched areas, and that only in exceptional cases would it pay to remove the mulch; nor would it be advisable to refrain from mulching because fears of frost are entertained. When the temperature is rising or stationary, the thermometer over bare ground often reads as low or lower than the one over straw. It is only when the temperature is falling that the one over straw records the lower temperature; such at least has been the fact thus far. This being the case, it is possible to obtain data that bear upon the question only when a frost is likely to occur. From the few observations that have been made it is not possible to deduce a law. The increased security from mulching, as a protection against drouth and winter-killing, would, probably in almost all cases, more than counterbalance the increased danger from frost caused by mulching. For the purpose of testing the value of mulch for winter protection, a strip through the middle of a large bed was left uncovered. The winter was unusually severe, killing nearly all the wheat in the neighborhood. The mulched portions of the bed wintered well and bore a good crop. The unprotected plants were seriously injured, and in consequence the crop on this portion of the bed was greatly lessened. As compared with the same varieties in other parts of the field, the following exhibit shows the loss sustained by not mulching. The mulched plants bore a full crop, but those unprotected yielded as follows: Sharpless, 25 to 50 per cent. of a full crop; Crescent, 75 per cent. of a full crop; Cumberland, 75 per cent. of a full crop; Downing, 50 to 75 per cent. of a full crop; Windsor Chief, 75 per cent. of a full crop.

Had this experiment been tried the previous season, the winter-killing would have been less, but the drouth would probably have occasioned nearly as great a shrinkage in the crop. The plan was tried of removing the mulch in the spring, and cultivating the ground lightly between the rows and then replacing the material, and found to be very advantageous where weeds were abundant, as they were much more easily subdued in this manner than by pulling or cutting off with a hoe. Further than this there was no marked advantage. Indeed, where the straw was removed and applied again after cultivation, the plants suffered more from drouth than where the mulch was undisturbed. Hence, it seems safe to conclude that where the soil is weedy, or where there is weed seed in the straw, it is advisable to practice spring cultivation, but if weeds are not abundant, the operation will not pay, and may, if dry weather follows, be attended with loss.

Cross-fertilization.

The experiments commenced in 1884, to determine the immediate influence of pollen, were carried on. Essentially the same method as described in the last report was followed. Some plants, kept over winter in a cold frame, were also used. Several varieties of imperfect flowering sorts were operated upon. In all cases the plants were protected from the wind and insects, and the pollen artificially applied. The difficulty of obtaining pollen in sufficient quantity was experienced at the beginning of the first season's work, hence some of the berries were imperfect, but it was soon found that the pollen was shed freely from the anthers a few hours after the flowers had been picked. No trouble was experienced in getting a plentiful supply of pollen last season, consequently, nearly all the berries were quite as perfect as those produced on exposed plants. Although, crosses were produced readily and satisfactorily, the results were far from being decisive. In some cases there was an apparent resemblance in the berries produced by crossing, to the berries of the variety from which pollen was used, but in many other instances no similarity could be observed. The question is thus left open so far as our experiments are concerned. Experiments tried in other places the past season have not, so far as known, been conclusive.

None of the protected plants produced fruit unless pollen was artificially supplied to the flowers which corroborates former results, and shows that the conditions were perfect. It is possible that some imperfect flowering sorts may have sufficient pollen for self-fertilization if it be properly distributed by insects.

A neglected bed of Crescents, growing about fifteen rods from any other variety, bears more or less fruit, although so imperfect as not to be worth picking. The plants are among evergreen trees, and a raspberry plantation between it, and the other plantation, hence it is somewhat difficult for insects to fly from one direct to the other. The fruit is much more imperfect some seasons than others.

Some perfect flowering sorts bore fruit, although protected and undisturbed, hence we might reasonably expect Crescents and some others to do the same although bearing only a limited amount of pollen, but nothing of the kind has been observed where the experiment was properly conducted. It has not been possible to isolate plants in the open air so as to be perfectly sure that no pollen from other plants could reach them, through the agency of insects. It is doubtful if such an experiment would in any case be conclusive.

RASPBERRIES.

Nearly all the varieties named below were planted in 1883. Another planting of the same and many others was made in 1884. The season was somewhat peculiar, owing to which the table giving the time of blooming and ripening may need some revision. The unusually warm weather and abundant rains just before and at the time the fruit was ripening, shortened the season of fruiting, and caused the early and late sorts to mature more nearly at the same time than is usual. The late varieties were thus affected more than the early, hence the comparative times of ripening, as shown in the table, are not quite correct, as the late sorts are really later and have a longer season than that given. It is not probable, however, that the error in any case exceeds two or three days. The matter is unimportant, except for the reason that it is desirable to determine the comparative earliness of several varieties in order to settle some disputes that have arisen.

The weights and measurements are averages for the whole season, and are made up from notes taken at each picking.

The estimates of hardiness are made from two seasons' observations, both being unusually severe. In January, 1884, the thermometer registered 32 degrees below zero and 21 below in December of the same year. As the summer of 1884 was very dry, plants made a poor growth, and were consequently more injured by the cold of 21 degrees below zero than in the preceding winter when the mercury fell 11 degrees lower. It was noted that the winter-killing was not so great in some parts of the field as in less severe winters. One part of a patch of Turners growing upon very rich, and not thoroughly drained soil has been injured every year since planted, but less in 1884 than in milder seasons. This shows that estimates of hardiness must take into account other conditions besides temperature. For this reason duplicate plantings are made even in the same field.

TABLE III.—RASPBERRIES—COMPARATIVE SIZE AND TIME OF RIPENING.

Name of variety.	Date of first bloom.	Date of first ripe fruit.	Weight of 100 berries.	Average diameter.
			Ounces.	*Inch.*
Cuthbert	June 6	July 6	5	11-16
Crimson Beauty	1	June 24	5	5-8
Davidson Thornless	May 30	25	....	....
Florence	June 1	30	....	....
Gregg	3	July 4	5½	3-4
Hansell	May 30	June 23	4½	11-16
Hopkins	30	30	4½	5-8
Highland Hardy	30	24	4	9-16
Lost Rubies	June 1	30	5½	11-16
Montclair	3	30	5½	5-8
Marlboro	3	30	5¾	3-4
Michigan Early Red	1	27	4	9-16
Ohio	1	30	4¼	3-4
Souhegan	May 28	24	4	9-16
Superb	June 3	30	5	11-16
Shaffer's Colossal	5	July 4	6	3-4
Turner	3	June 25	4½	5-8
Thwack	3	July 1	4½	5-8
Tyler	May 28	June 24	4	9-16

NOTES ON VARIETIES.

Cuthbert.—Varying reports are heard concerning this variety. In some sections it appears to be satisfactory, while in others it is unproductive and not sufficiently hardy. It is undoubtedly variable and quite uncertain and must be tested for each locality. Where it does well it is without doubt one of the most valuable red sorts, but in such sections as this where extreme hardiness is a prime requisite it is unprofitable. Parties who think of planting the Cuthbert on a large scale should satisfy themselves as to its value in their locality before doing so.

Crimson Beauty.—Plants not entirely hardy, and only moderately productive. Fruit second quality, but beautiful in appearance, and is said to sell well in market. Reports are favorable from some sections, but not from all, hence cannot be recommended for general cultivation.

Florence.—A yellow variety, but of apparently little value.

Gregg.—Is still the leading black-cap, although there is much complaint as to its tenderness. Upon well drained soils it appears to be quite hardy, but does not rank quite as high as Tyler and Ohio in this respect. There is no well tried late variety to take its place. The Nemehak is said to be as late and much hardier, but has not been thoroughly tested.

Hansell.—One of the earliest of the reds, but generally found to be unproductive. The plants make only a moderate growth, and have not proved to be entirely hardy, although they have not been injured so much as those of Crimson Beauty and Cuthbert. The berries are of good size and color, and mature quickly, making the season quite short. In this respect it may be considered earlier than the Turner, although the first ripe berries appear on each at about the same time. The Hansell crop is soon ripe and gone, while that of the Turner lasts longer and is much larger. Even when the pickings from the Hansell are at their best the yield is no larger than from the Turner at the same time, hence the Turner is quite as valuable as the Hansell as an early sort, and yields a large crop after the Hansell is done bearing.

Hopkins.—This second early black-cap seems to have been neglected. The plants are quite vigorous, hardy and productive, while the fruit is of fair size and of good color and quality. Reports concerning it are generally favorable, and it may be safely planted where a medium early sort is wanted.

Highland Beauty.—Was planted for comparison merely, being no longer desirable, as it is superseded by better sorts.

Lost Rubies.—Under the name of Naomi this variety was once favorably known. The plants are quite hardy and productive, but the fruit is quite soft and crumbles badly, hence does not sell well in market. In quality, however, it is excellent, and is very superior for canning purposes. There are many better varieties, and it is for that reason discarded by nearly all growers.

Montclair.—Plant vigorous, hardy and productive. Fruit large, good quality, soft, dark and rather dull in color. But little notice seems to have been taken of this sort, although it possesses more good qualities than the majority of those that have been so vigorously pushed into notice. For market the color of the fruit its and softness are objectionable, but for home use the Montclair is the peer of any of the reds variety.

Marlboro.—This variety appears to sustain the reputation given it at the outset. The plants are hardy, healthy and productive. The fruit is large, firm and beautiful in appearance. By some it is rated as good in quality, while other class it as medium. Although there are red sorts that are as good or better for home use it is already ranked by most good judges as a very valuable market variety.

Michigan Early Red.—Although quite early, this variety has no qualities to recommend it for general cultivation.

Ohio.—Much has been claimed for this variety of late, and the probability is that it has not been rated too high. The plants are vigorous, hardy and productive. One of the most desirable of the early black-caps.

Reliance.—Gives satisfaction in some sections, where it is reported to be the most profitable of all red sorts, but from other places the reports concerning it are unfavorable.

Superb.—Not sufficiently hardy. Fruit soft and of dark, dingy color. There are so many better red sorts that the Superb may be dropped from the list without loss.

Shaffer's Colossal.—No red variety has received more disinterested and deserved praise than this. The plants are vigorous and wonderfully productive, while the fruit is considered to be unequaled for canning purposes. For home use there is probably no other variety so desirable. It seems to do well almost everywhere, and the fact that the plants do not sprout from the root is a great advantage to private growers. The fruit being of an objectionable color and quite soft would seem to render it unmarketable, but examples are numerous where it has sold at the highest prices when customers became aware of its excellent quality. Shaffer's Colossal stands pre-eminently at the head of the list for private growers and is fast taking a high rank as a profitable market variety.

Souhegan and *Tyler*.—These are distinct varieties, or at least had a different origin, but are so nearly identical that there is no longer any use of both names. The fruit of the Souhegan is possibly somewhat more glossy than that of the Tyler, while the plants of the latter are perhaps rather more vigorous in growth than those of the former. This variety, whichever name may be adopted, is fast coming into prominence because of its earliness, hardiness, and productiveness. Good reports concerning it come from almost every section, so that there can no longer be any doubt of its value for general cultivation.

Thwack.—Although possessing many good qualities, is superseded by better varieties.

Turner.—Plants very hardy and productive. Fruit of good quality but only medium in size and quite soft. In spite of its faults this variety still ranks as one of the most profitable reds. To secure good results the sprouts should not be allowed to grow too thickly. The best plan is hill culture, setting the plants five feet apart each way and allow only three or four canes to grow in each hill. This method insures good crops while the fruit is much improved in size and firmness. Grown in this manner the Turner is a very profitable variety, but when grown in the hedge-row system the fruit is small and soft and almost worthless for market.

The following varieties are on trial: Carman, Hilborn, Nemaha, Rancocas, Meredith Queen, Shaffer's Sister, Kagy's Everbearing, Key's Prolific, Palmer's Seedling, Springfield, Caroline, Golden Queen, Silver Queen, Chapman, Baumforth's Seedling.

BLACKBERRIES.

The following varieties have been planted: Early Cluster, Early Harvest, Brunton's Early, Snyder, Taylor, Stone's Hardy, Wilson, Jr., Wallace, Staymen's Early, Minnewaski.

Snyder and Stone's Hardy were the only varieties that passed through the winter uninjured. Taylor plants were partially killed. Minnewaski was not planted until the spring of 1885, hence no statement can be made as to its hardiness; except that has, however, withstood a cold of 12° below zero the past winter, unharmed.

A variety of blackberry that is as hardy as the Snyder, with fruit as large as that of the Lawton or Kittatinny is greatly needed at present. Several varieties that are said to answer that description have been promised for trial.

EXPERIMENTS WITH GARDEN VEGETABLES.

The work with vegetables during the past season was mainly a continuation and extension of that mentioned in previous reports. Some progress has been made in the determination of synonyms, but many doubtful cases remain for further study. The difficulties are increased from the fact that stocks of any given variety from different sources are often very diverse in character, even when comparatively pure. It is scarcely possible in many instances to do more than group similar forms, and either recognize them as varieties or as strains of one variety. Cases occur where the divergence of a particular strain is very slight, and yet practically it is of much greater value than less closely allied strains. Very often it is not possible to define the difference between two strains in botanical terms, although one may be valuable and the other comparatively worthless; hence it is evident that if the work is to have a practical bearing something more is to be done than to note botanical distinctions. Impure stock is also the cause of much annoyance and perplexity, and it is impossible in many cases to determine the relations of alleged varieties because of the diversity of forms that appear.

For much of the confusion that now exists in vegetable nomenclature, no one in particular is to blame. Many varieties are known under numerous names that are easily recognized as slight variations of the original name. This partly arises from carelessness in writing the names, and partly from a desire to make them descriptive, as Early Round Blood Turnip Beet. Such names are objectionable because of their length, and are often quite inappropriate. The practice that some seedsmen have of prefixing their names to varieties is sometimes defended on the ground that they are thus obliged to look more carefully after the growing of their stock. The fact that quite as good, and in many cases better stock can be obtained from dealers who do not resort to the practice, is sufficient to show that it has no significance.

The renaming of old varieties, whether of foreign or domestic origin, by a dealer prefixing his name, and calling it his "Earliest" or "Best", is nothing less than an effort to deceive the public, and is a reprehensible practice. Doubtless such cases will be the last to yield to reform.

Much might be accomplished, however, if seedsmen would agree upon a uniform method of writing names of varieties. The word Egyptian would serve as well for the name of an early beet, as Extra Early Egyptian Blood Turnip, or any other of the variations in use. Such a course would greatly simplify matters, and harm no one. In the notes on varieties a distinction is made between known and probable synonyms. The latter are usually spoken of as having marked resemblances. Notes were taken on each variety planted, as to purity, uniformity, trueness to type, etc. The name of the seedsman from whom the seed was procured is given in each case, because such a course is necessary in order to make the notes intelligible and useful. This part of the work is not undertaken merely for the purpose of investigating the quality of stock sold by different seedsmen but rather for the purpose of showing the importance of *selection*. The necessity of great care in growing seeds is not fully realized by the public; nor is the value of good stock fully appreciated. If this work could be extended so as to include stock from all the principal seed dealers and growers, and trials be made in several sections of the country, the results could not fail to be of great value to seed buyers, and might also do much to put the seed trade on a better basis, by showing the risk attending the use of *cheap seeds*, and the economy of buying only the best.

Trials of varieties must of necessity be comparative, hence old sorts are retained to serve as standards by which to judge the merits of the new. The soil upon which the vegetables were grown was not in sufficiently good condition to give large yields, but since all varieties were treated alike the comparisons hold good.

All classes of vegetables have not been grown for want of means and suitable soil. Seed was procured direct from the seedsmen, but hereafter it will be procured both directly and indirectly.

BEETS—EARLY.

Twenty-one varieties of early beet seed were sown May 5. Seed of some varieties was obtained from several sources for the purpose of comparing the quality of stock. An attempt was made to determine comparative earliness of varieties, but owing to difference in quality of stock the result was unsatisfactory. Sixty-four days from the time of sowing, the beets, two inches or more in diameter, were counted in each row.

The greatest number was found in the row of Crosby's Egyptian, seed of which was procured from J J. H. Gregory. Eclipse from A. W. Livingston's Sons, and Bastian's Extra Early from Peter Henderson & Co., were next in earliness, while Landreth's Very Early, Bassano and Egyptian from D. Landreth & Sons ranked third. Egyptian from A. W. Livingston's Sons, and Eclipse from W. Atlee Burpre & Co., took the fourth place with Blood Turnip. Doubtless there is very little difference in the earliness of the varieties named, and another trial might give quite contradictory results. There was a marked contrast in quality of stock, which is particularly mentioned in the notes on varieties.

Notes on Varieties.

Bassano. (D. Landreth & Sons) A well known popular variety. A strong grower, requiring more room than the seort-topped sorts. Stock good, showing but little variation.

Bassano. (A. W. Livingston's Sons.) Stock shows careful selection.

Bastain's Extra Early. (Peter Henderson & Co.) Not as vigorous in growth as Bassano; beets similar in shape, but the skin and flesh are darker in color. A very desirable variety. Stock pure. Probably the same as Philadelphia Early.

Bastain's Extra Early Red Turnip. (W. Atlee Burpee & Co.) Same as Bastain's Extra Early. Stock impure, shows a mixture of Bassano.

Dewing's Improved Blood Turnip. (Peter Henderson & Co.) A very good strain of Blood Turnip. Perhaps a few days latter than the Egyptian.

Burpee's Improved Blood and *Burpee's Early Turnip*, from W. Atlee Burpee & Co., appear to be identical with the above, but the stock was so badly mixed as to make identification impossible.

Maule's Blood Turnip (Benson, Maule & Co.) and *Wilson's Ear-y Blood Turnip* (Samuel Wilson) are identical with Dewing's Improved Blood Turnip. Stock compatatively pure.

Crosby's Early Egyptian. (J. J. H. Gregory.) The same as Egyptian, but is an improved strain. The beets are thicker and somewhat more regular in shape than the ordinary Egyptian.

Egyptian. (A. W. Livingston's Sons.) Stock quite pure.

Egyptian Extra Early Turnip. (D. Landreth & Sons.) Same as the above. Stock not quite pure, showing a small percentage of Bassano.

Eclipse, A. W. Livingston's Sons.) About as early as the Egyptian, and perhaps superior to that variety. The beets are more nearly globular and of better color. Stock shows a slight mixture, and a tendency to revert to inferior forms.

Eclipse. (W. Atlee Burpee & Co.) Same as the above. The Eclipse is spoken of in the Fourth Annual Report of the New York Experiment Station as follows: "The Eclipse Turnip (Henderson) was very different in some respects from the same of Gregory, being much larger in size and less regular in form." It is probable that the Eclipse has not been brought up to the highest possible perfection. Different stocks of it seem to vary considerably which indicates that selection has not been carried far enough.

Landreth's Very Early. (D. Landreth & Son.) Resembles the Bassano in shape of root, but the tops are shorter, while the flesh has a larger percentage of red. Quite desirable. Stock pure.

Omega. (Isaac Tillinghast.) Resembles the Pine Apple; probably identical.

Pine Apple. (Henderson.) The roots are rather longer and not so thick as Bastain's Extra Early, but similar in color. Perhaps a few days later than the other early sorts. Thought by some to be of superior quality, but the shape is objectionable for market purposes.

Philadelphia Perfection. (Johnson & Stokes.) Resembles Bastain's Extra Early, but is rather stronger in growth and later. Quite desirable; good stock.

Philadelphia Early. (D. Landreth & Sons.) Very poor stock. Apparently Bastain's Extra Early, and Landreth's Extra Early mixed.

CABBAGE—EARLY.

Seed of early cabbage was sown March 23. The plants were transplanted April 18, and set in the field May 12. The growth was rapid and healthy from the start. Care was taken to select plants of as near a uniform size as possible of each variety. About fifty plants of each sample were used, thus making it possible to determine with considerable accuracy percentage of variation. The first cutting of each variety was made as soon as five or more heads were ready. The last cutting was made when the latest heads were fit for market. Single heads of some sorts were fit to cut before the date given, but the time of maturity of the first head is not given, because such data are often very misleading, and the more so with varieties that are not uniform.

The notes given at the right of the table are perhaps sufficiently explanatory. It may be remarked, however, that Early Wakefield is the most reliable for first early, Early Summer for second early. Low's Peerless is a very promising sort. Chase's Excelsior, Early Deep Head and Fottler's Brunswick are the best next in succession. Early Etampes, Early Advance, Premier, Johnson & Stokes' Earliest, and Landreth's Earliest are quite early but are unreliable, forming very few solid heads. The difference in stock from various sources is worthy of note.

TABLE IV.—EARLY CABBAGE.

Name of variety.	Date of first cutting.	Date of last cutting.	Weight of largest head.		Average weight of heads.		Average circumference of heads.	Remarks.
			lbs.	*oz.*	*lbs.*	*oz.*	*In.*	
Bloomsdale Early Market—D. Landreth & Son	Aug. 1	Aug. 14	4	9	3	10	21	Heads usually conical, solid. A reliable variety; resembles Large Wakefield, but is rather better.
Berkshire Beauty-I. Tillinghast-Puget Sound seed	" 1	" 14	3	8	2	14	23	Heads quite solid, but show some tendency to rot.
Berkshire Beauty—Benson, Maule & Co	" 1	" 14	2	14	2	11	22	Same.
Chase's Excelsior—A. W. Livingston's Sons	" 1	" 14	6	6	4	3	24	Stock good; shows careful selection; very sure to head; heads solid; formed heavier heads in 1884.
Drumhead St. John's Day—Vilmorin, Andrieux & Co	July 13	July 23	5	6	3	4	24	Heads quite solid, but are very apt to crack open; variable as to earliness. Not so desirable as Wakefield.
Early Advance—W. Atlee, Burpee & Co	" 13	" 23	1	11	..	...	20	Resembles Early Etampes; heads loose. Poor stock; badly mixed.
Early Dwarf Flat Dutch—D. Landreth & Sons	Aug. 1	Aug. 14	5	1	3	5	24	Heads quite solid. Good stock; shows but little variation.
Early Flat Dutch—D. Landreth & Sons	" 1	" 14	5	2	2	14	22	Leaves have a silvery appearance; quite distinct.
Early Flat Dutch—Benson, Maule & Co	" 1	" 14	3	11	3	11	22	Good stock.
Early Flat Dutch—Peter Henderson & Co	" 1	" 14	4	10	3	8	23	Shows little variation.
Early Etampes—Vilmorin, Andrieux & Co	July 13	July 23	4	...	2	12	20	Heads rather loose. But little variation from type.
Early Etampes—Johnson & Stokes	" 13	" 23	3	5	2	8	20	Same.
Early Etampes—D. M. Ferry & Co	" 13	" 23	3	6	2	9	19	Same.
Early Etampes—J. J. H. Gregory	" 13	" 23	3	3	2	7	20	Not as good stock as the other lots; showed considerable variation.

TABLE IV.—Continued.

Name of variety.	Date of first cutting.	Date of last cutting.	Weight of largest head.		Weight of smallest head.		Average circumference of heads.	Remarks.
			lbs.	*oz.*	*lbs.*	*oz.*		
Early Etampes—Benson, Maule & Co	July 13	July 23	4	...	2	7	21	Good stock; even, true.
Early Etampes—Francis Brill	" 13	" 23	4	6	2	12	21	True; very little variation.
Early Drumhead—Francis Brill	Aug. 1	Aug. 14	5	5	3	7	24	
Early Bleightfield Giant—D. Landreth & Sons	" 1	" 14	4	10	3	...	21	Heads quite solid. Good stock.
Early Bleightfield Giant, P.S.—Isaac Tillinghast	" 1	" 14	3	4	2	10	20	Same.
Early Bleightfield Giant—Benson, Maule & Co	" 1	" 14	5	13	4	5	24	Same.
Early Deep Head—J. J. H. Gregory	" 1	" 14	6	1	4	10	28	Heads solid. Well selected; shows but little variation.
Early Wyman—J. J. H. Gregory	" 1	" 14	5	11	3	13	21	Heads solid. Resemble Large Wakefield in shape.
Early Winningstadt—A. W. Livington's Sons	" 1	" 14	5	8	3	...	19	Good stock; very even, true. All solid heads.
Early Dwarf York—James Vick	July 13	July 23	2	1	1	8	16	A very poor variety.
Early Wakefield—Francis Brill	" 10	" 23	4	...	3	12	21	Extra good stock; shows almost no variation; apparently, has been selected with great care.
Early Wakefield—W. Atlee, Burpee & Co	" 13	....	3	14	..	...	......	Only 20 per cent. true; 80 per cent. a mixture of late varieties. Some not fit to cut until Aug. 19; many of the plants formed no heads at all.
Early Wakefield—Benson, Maule & Co	" 13	July 23	3	13	2	8	20	Quite true; good stock.
Early Wakefield—D. M. Ferry & Co	" 10	" 23	5	14	3	...	22	Quite good stock; a few doubtful forms.
Early Wakefield—J. J. H. Gregory	" 13	" 23	4	5	2	13	20	Stock not pure; shows a considerable percentage of Early Summer and later sorts.
Early Wakefield—Joseph Harris	" 13	" 23	5	5	2	5	21	Contains a slight percentage of Early Summer or some later form, but otherwise very good stock.
Early Wakefield—Peter Henderson & Co	" 13	" 23	3	12	2	11	20	Good stock; although not quite pure, contains nothing undesirable.

Early Wakefield—Johnson & Stokes	" 13	" 23	3	14	3	2	21	Very true, even, good stock; shows but little variation.
Early Wakefield—A. W. Livingston's Sons	" 13	" 24	3	5	2	10	20	Fairly good stock; shows some variation, but not enough to be injurious.
Early Wakefield—D. Landreth & Sons	" 13	" 23	3	1	2	8	20	Extra good stock; very pure and true to type.
Early Wakefield, P. S.—Isaac Tillinghast	" 23	Aug. 14	5	8	3	5	23	Rather later than most other strains of Wakefield, but in other respects quite as good. Resembles the Late Wakefield greatly.
Early Wakefield—James Vick	" 10	July 23	3	2	2	8	19	Extra good stock; shows careful selection.
Early Wakefield—Samuel Wilson	" 13	" 23	2	13	2	5	20	Good stock.
Early Wakefield, large—D. Landreth & Sons	Aug. 1	Aug. 14	4	10	3	9	22	Very even; shows little variation.
Early Wakefield, large—Francis Brill	July 23	" 14	5	5	3	6	22	Same.
Early Summer—W. Atlee, Burpee & Co	....	....	..	...	..	...	......	Not true; considerably later than E. Summer.
Early Summer—Francis Brill	July 23	Aug. 14	4	8	3	5	24	Very uniform.
Early Summer—Benson, Maule & Co	" 23	" 14	8	4	4	8	25	Quite good; a few of a later variety.
Early Summer—D. M. Ferry & Co	" 23	" 14	4	8	3	6	24	Good stock; shows but little variation.
Early Summer—J. J. H. Gregory	" 23	" 14	4	9	3	...	23	Same.
Early Summer—Joseph Harris	" 23	" 14	5	14	3	6	24	Same.
Early Summer—Peter Henderson & Co	" 23	" 14	4	4	3	2	24	Same.
Early Summer—Johnson & Stokes	" 23	" 14	5	4	3	10	25	Apparently the same as Landreth's Early Summer.
Early Summer—A. W. Livingston's Sons	" 23	" 14	5	3	4	...	24	A few heads of a later variety, but on the whole good.
Early Summer Flat Head—D. Landreth & Sons	" 23	" 14	3	12	2	10	23	Rather shorter stemmed than Henderson's. Leaves yellowish green. Shows need of more careful selection.
Early Summer, P. S.—Isaac Tillinghast	" 23	" 14	7	4	4	7	27	Quite true, even, very carefully selected stock.
Early Summer—James Vick	" 23	" 14	5	14	4	4	25	Good stock, although somewhat later on the average than some strains.
Early Summer—Samuel Wilson	" 23	" 14	4	...	2	6	......	Resembles Landreth's Early Summer.
Fottler's Improved Brunswick—Isaac Tillinghast	Aug. 14	....	6	1	4	6	28	A very desirable variety. Good stock.
Johnson & Stokes' Earliest—Johnson & Stokes	July 13	July 23	3	14	2	4	20	Resembles Early Etampes, although perhaps not identical. Heads loose and light.
Landreth's Earliest—D. Landreth & Sons	" 13	" 23	4	4	3	5	22	Of the Etampes type, but extremely variable in form and earliness. Heads usually soft. Quite unreliable.
Low's Peerless—J. J. H. Gregory	Aug. 1	Aug. 14	6	13	3	8	......	Probably a form of Early Flat Dutch, but a very excellent strain; very uniform.
Premier—Peter Henderson & Co	July 13	July 23	2	3	1	10	18	Resembles Paris Market. Heads loose and soft. Unreliable here.

CABBAGE—LATE.

Seed of late cabbage was sown May 15 and the plants set in the field June 25. About seventy-five plants of each variety and strain were planted. The plants of each variety were divided into two lots. One lot was planted on the Station grounds and the other lot was sent to Loder E. Green, of Medina county. Thus the trial was duplicated throughout, with the exception of a few sorts. Plants sent to Medina county gave uniformly better results than were obtained with those at the Station. This was probably due to richer soil and more favorable climatic conditions.

In making up the table the average was obtained by combining the results from both localities. The percentage of the heads formed is also the average of both. The heaviest weight given is in every case, except two, that obtained in Medina county. Some sorts, seeds of which were obtained from Europe, failed in both localittes, as did also several obtained from American seedsmen. The percentage of heads formed may seem to be quite low in most cases, but marketable heads only were counted. These percentages, in connection with the notes, will give a better clue to the value of any variety than will the weight of heads.

TABLE V.—LATE CABBAGE.

Name of variety.	Heaviest head.		Average weight of heads.		Per cent. plants that formed solid heads.	Remarks.
	Lbs.	oz.	Lbs.	oz.		
Drumhead, Short Stem—Samuel Wilson	7	8	3	8	21	Failed here; record given is for northern Ohio.
Drumhead, Late American—Isaac Tillinghast	9	3	5	9	68	Very even; fine stock.
Drumhead, Royal German—Johnson & Stokes	9	4	5	12	72	Short stemmed; very fine stock.
Drumhead, Premium—D. M. Ferry & Co	6	14	3	12	41	Heads mostly loose; stock rather uneven.
Drumhead, Short Stem—W. Atlee, Burpee & Co	8	6	6	5	67	Short stemmed; very even, good stock.
Drumhead, Bridgeport—A. W. Livingston's Sons	10	8	6	8	60	Good stock; heads very solid.
Drumhead, Improved—Francis Brill	11	12	6	15	69	Short stemmed; very even, fine stock.
Drumhead, Stonemason—Francis Brill	8	00	4	6	40	Good stock, although many heads were soft.
Drumhead, Silver Leaf—Francis Brill	6	2	5	7	53	Heads rather loose; stock even.
Drumhead, Louisville—Francis Brill	8	8	6	5	74	Short stemmed, very uniform; heads solid. A very desirable variety.
Drumhead, Short Stem—Francis Brill	10	00	5	14	45	A good variety, but perhaps not so reliable as the above. Heads solid but variable in size.
Drumhead, Marblehead Mammoth—Peter Henderson & Co.	8	6	6	4	69	Heads soft; this variety seldom does well here.
Flat Dutch, Prize—Benson, Maule & Co.	4	9	2	11	33	Apparently somewhat variable; not suited to this locality.
Flat Dutch, Pale Green—Francis Brill	6	8	5	00	50	Heads rather loose.
Flat Dutch, Excelsior—Francis Brill	9	00	5	6	70	Very uniform and true to type, but was considerably affected by the heat. Was much better in northern Ohio than here.
Flat Dutch, Premium—Francis Brill	10	00	6	12	65	Not so uniform as the above, but perhaps better for this section.
Flat Dutch, Bristol—Francis Brill	9	8	6	12	70	Good stock, although it shows a little variation.
Flat Dutch, Superior—W. Atlee, Burpee & Co	9	10	4	8	30	Shows some tendency to rot. Heads quite loose.
Flat Dutch, Excelsior—Isaac Tillinghast	6	4	4	00	53	Quite variable, showing both long and short stemmed types.
Flat Dutch, Premium—J. J. H. Gregory	8	12	5	15	64	Somewhat variable; both long and short stemmed.
Flat Dutch, Premium—Samuel Wilson	5	12	4	9	56	Same.

TABLE V.—Continued.

Name of variety.	Heaviest head.		Average weight of heads.		Per cent. plants that formed solid heads.	Remarks.
	Lbs.	*oz.*	*Lbs.*	*oz.*		
Flat Dutch, Selected—Peter Henderson & Co.	10	8	6	00	66	Very uniform and true. Did not, however, give as good result as last season.
Flat Dutch, Premium—Peter Henderson & Co	12	8	6	7	73	Mostly of the long stemmed type, but quite uniform. Apparently a very desirable sort for this section.
Flat Dutch, Premium—Johnston & Stokes	7	12	5	15	40	Mostly long stemmed; quite uniform and good.
Flat Dutch, Premium—A. W. Livingston's Sons	9	8	5	9	88	Long stemmed; quite uniform; reliable strain.
Flat Dutch, Premium—Hiram Sibley & Co	9	00	6	00	50	Mostly long stem, but rather uneven.
Flat Dutch, Large—Hiram Sibley & Co	8	00	5	6	47	Similar to the above.
Flat Dutch, Premium—Joseph Harris	7	4	5	6	29	Mostly long stemmed; rather uneven.
Flat Dutch, Excelsior—Joseph Harris	7	8	4	6	55	Short stemmed. Affected considerably by heat.
Flat Dutch, Large—James Vick	……	……	……	……	……	No heads formed.
Flat Dutch, Excelsior—James Vick	8	00	4	5	42	Short stem, quite uniform.
Flat Dutch, Premium—James Vick	7	13	5	14	53	Long stem, somewhat variable.
Flat Dutch, Premium, P. S.—Isaac Tillinghast	6	12	5	3	75	Mostly long stemmed type, somewhat variable.
Flat Dutch, Excelsior, P. S.—Isaac Tillinghast	6	00	4	3	33	Short stem. Affected considerably by the heat.
Flat Dutch, Premium, E. G.—Isaac Tillinghast	9	8	5	15	60	Quite uniform, but heads rather soft.
Flat Dutch, Premium—D. M. Ferry & Co	5	8	3	15	50	Long stemmed. Rather uneven.
Flat Dutch, Bloomsdale—D. Landreth & Sons	7	4	5	6	87	Long stemmed, but very uniform. A very reliable variety.
Large Late Mountain—D. Landreth & Sons	5	8	4	8	32	Did not mature properly.
Surehead—W. Atlee, Burpee & Co.	7	8	4	15	57	Quite uniform. A reliable variety.
Surehead—Johnston & Stokes	8	10	5	9	70	Same.
Surehead—Benson, Maule & Co	7	8	5	00	47	Same.
Surehead—Francis Brill	10	8	6	4	54	Same.
Surehead—Samuel Wilson	8	12	5	5	77	Same.
Savoy, Drumhead Perfection—Francis Brill	4	8	3	00	68	Uniform, good. The Savoys usually give very poor results here.
Savoy, Drumhead—A W. Livingston's Sons	7	00	4	00	30	Same.

The following varieties from American seedsmen failed to form heads: Dwarf Ulm Savoy, D. M. Ferry & Co.; Golden Savoy, Johnson & Stokes; Pomerain or Filder, James Vick; Green Glazed, Peter Henderson & Co.; Drumhead, Large Red, Francis Brill; Large Flat Dutch, James Vick. Marblehead Mammoth Drumhead, from no seedsman, gave good results. Chase's Excelsior nearly failed as a late sort, as did also several strains of Fottler's Brunswick. Premium Flat Dutch was better in most cases than Excelsior Flat Dutch, although the distinction between them is not well marked, at least not as shown by the samples received under these names.

CARROTS.

Carrot seed was sown May 7, in rows eighteen inches apart. The plants were thinned to three inches apart in the row. Doubtless a better development of root would have been obtained had more space been allowed. The conditions were, however, the same for each variety so far as known.

The yield of sixteen feet of row is given, although that alone is not enough for comparison. The remarks made concerning each variety, and the character of stock from each seedsman, together with the yields will aid any one in making selections for particular purposes. The Long Orange is, perhaps, the best of all if productiveness alone is considered, but its length of root is objectionable. Danvers and Geurande yield nearly as heavily, and are much easier to dig. The Geurande, especially, is worthy of all the praise it has received.

TABLE VI.—CARROTS.

Name of variety.	Weight of roots from 16 feet of row.		Remarks.
	lbs.	*oz.*	
Carentan Early, Half Long (Vilmorin, Andrieux & Co)	9	13	Half long, often stump rooted, very even, true.
Danvers (Peter Henderson & Co.)	13	10	Half long, regular smooth, good stock, pure and true. Perhaps the best variety for general purposes.
Danvers (D. M. Ferry & Co.)	14	14	Extra good stock.
Danvers (James Vick)	13	00	Pure, true to type.
Danvers (D. Landreth & Sons)	12	3	Considerably mixed with a white variety; roots uneven and rough.
Dutch Horn, Early Short Stump Rooted (Vilmorin, Andrieux & Co.)	8	1	Very short, regular, even. Adapted to forcing, but not suitable for field culture.
English Horn (Vilmorin, Andrieux & Co.)	8	00	Half long but irregular and poor.
Early Very Short Scarlet (James Vick)	9	8	Almost turnip shape, regular; even in size; good stock. Useful only for forcing.
Early Scarlet Horn Blunt Rooted Rooted (D. Landreth & Sons)	8	1	Similar to preceding, probably identical.
Early Half Long, Stump Rooted (Vilmorin, Andrieux & Co.)	11	15	Half long, similar in shape to Danvers, but not so desirable.
Extra Early Forcing (D. Landreth & Sons)	10	13	Similar to French Horn.
Early French Short Horn (James Vick)	14	2	Probably identical with French Horn.

TABLE VI.—Continued.

Name of variety.	Weight of roots from 16 feet of row.		Remarks.
	lbs.	*oz.*	
Early Scarlet Horn (D. M. Ferry & Co.)	13	9	Similar to the preceding.
French Horn Early Short Forcing (Vilmorin, Andrieux & Co)	12	7	Very short, almost turnip shape; good stock.
Geurande (D. M. Ferry & Co.)	15	10	Very short, stump rooted; regular; even in size; good stock.
Geurande (J. H. Gregory)	14	14	Not quite as good stock as the preceding. A very desirable variety.
Half Long Stumped Rooted (James Vick)	9	1	Probably identical with Early Half Long Stump Rooted.
Half Long Luc (Vilmorin, Andrieux & Co.	15	6	Similar to Danvers, but of smaller diameter.
Harris Half Long (Joseph Harris)	13	15	Much like Danvers. Roots vary considerably in size and shape.
Large White Belgian (D. Landreth & Sons)	13	12	Quite long, smooth, regular; good stock. A good variety.
Long White Belgian Green Top (James Vick)	14	12	Probably the same as above, although usually longer.
Long White Green Top (Vilmorin, Andrieux & Co)	13	6	Very long and slender. Not desirable.
Large Short White Vosges (Vilmorin, Andrieux & Co.)	8	10	Quite short, almost turnip shape; quite smooth and regular.
Long Orange (James Vick)	15	6	Probably the best of the long sorts; yields heavily. Smooth regular, good stock.
Long Orange (D. Landreth & Sons)	19	11	Very smooth and regular. Good stock; carefully selected.
Long Red St. Valery (Vilmorin, Andrieux & Co.)	11	9	Smaller than the preceding. No so desirable.
Long Scarlet Altringham (Vilmorin, Andrieux & Co	8	8	Long, slender, very rough and poor.
Long Red, without core (Vilmorin, Andrieux & Co.)	9	8	Slender, rough and irregular.
Long Red Surry (Vilmorin, Andrieux & Co.)	9	5	Very irregular and rough.
Nantes Early Half Long (Vilmorin, Andrieux Co.)	9	7	Half long, tapering very little. Apparently unproductive.
New Half Long (D. Landreth & Sons)	14	11	Resembles Danvers, but rather shorter. May be desirable if distinct.

CORN, SWEET.

Sweet corn was planted June 6.

Table VII gives the time of edible matarity, height of stalk and lenght of ear of each variety, at least approximately. It is not possible to secure in every instance uniform strains of varieties, nor can the same variety be kept pure from year to year, hence comparisons in different seasons may give quite contradictory results. Strains of the same variety may vary in earliness a week or more, and in other respects quite as much. Had seed been procured from several sources the results might have been more satisfactory. The table will, however, serve as a guide in the selection of varieties for a succession.

Especial attention is called to Ford's Early Sweet as a very desirable early sort. It is nearly as early as the Marblehead, and much superior in quality. The Golden Sweet excels all others tested as to quality. It cannot be praised too highly as a variety for home use. As a second early for market, Livingston's Early Evergreen is unexcelled.

TABLE VII.—SWEET CORN.

Name of variety.	Edible.	Average length of ear.	Aerrage height of stalk.	Remarks.
		Inches.	*Feet.*	
Amber Cream	Aug. 20	7	6	Quality good.
Adam's Extra Early	10	5	4	Quality very poor. Valuable only for earliness.
Bonanza	15	7	5	Very similar to E. Minn., probably identical, at least not superior to that variety.
Crosby's Extra Early	15	6½	5	Quality medium.
Cory	10	6	4	Resembles E. Marblehead. Superior to that var. in appearance of ear.
Egyptian	24	7½	7	A standard sort.
Early Orange	15	6	5	Quality very good.
Early Montana	12	5	3½	Quality medium. Resembles Tom Thumb.
Early Minnesota	15	7	5	Generally consibered to be a standard sort.
Early Concord	20	6	6	Quality good.
Ford's Early Sweet	12	6	5	Quality good, better than Marblehead.
Ford's Improved Mammonth	24	7½	6½	Quality good.
Golden Sweet	20	6	5½	Quality ex. good. One of the very best for home use, but not desirable for market.
Hickox	24	7	6	Quality good.
Livingston's Early Everygreen	20	7	7	Quality good. A very desirable second early var. especially valuable for market.
New Triumph	20	6½	6½	Quality good.
New Pee & Kay	15	6	6	Quality good. Very desirable for second early.
Perry's Hybrid	15	6	5	Resembles Early Orange, probably identical.
Potter's Excelsior	20	7½	6½	Quality excellent.
Rose's Improved Evergreen	18	7	6½	Quality good.
Red Cob Evergreen	24	7	7	Quality very good.
Stowell's Evergreen	24	7	7	Quality excellent.
Sugar Corn	24	7½	7½	Quality very good.
Tom Thumb	15	5	4	Quality poor.
White Marblehead	10	6	4	Quality medium. A standard early sort.

CELERY.

The trial of varieties resulted unsatisfactorily, owing to unsuitable soil and unfavorable conditions. A method of growing celery was tried which appears to be especially useful in dry seasons, and upon soils not well adapted to the crop naturally. It is simply a modification of the trench system. The trenches, or beds, are made about four feet wide and as long as desirable. The soil should be excavated to the depth of one foot and about six inches of surface soil, well mixed with fine manure, returned to the trench. If the surface soil is a foot or more in depth it is unnecessary to excavate more than six inches of the surface, and spade in a liberal supply of well rotted manure in the bottom of the trench. In this trench the plants should be set in rows, 12 to 14 inches apart, crosswise of the bed, and six inches apart in the rows. Where water is available irrigation should be practiced. The soil thrown out of the bottom of the trench serves for earthing up, or tile may be used. After earthing up is completed the bed may be covered with straw and the celery kept until very severe freezing occurs. For family gardens this method is particularly applicable, as but little space is required to grow a supply. If the bed is conveniently located near the pump, it can be easily irrigated as often as desirable.

ONIONS.

All of the work with onions, except thick and thin seeding, was duplicated in Medina county by Loder E. Green. The yields in that locality were uniformly larger than at the Station. At the Station three series of plots were sown, while the series were duplicated in Medina county, thus each series was repeated five times. The plots were the one-thousandth of an acre in size. In the tables the yield is given per acre, as calculated, being more convenient for reference and comparison.

Table VIII. is a comparison of stock from different seedsmen. It will be noted that there was a wide range in yield. This was undoubtedly due to the character of the stock, as the result corresponds with previous trials, and the individual plots, in most cases, agreed very closely with the averages given in the table. The late ripening strains gave larger yields in all cases, except one, while the average yields of the late plots are considerably higher than the average of the early ripening plots. There were rather more scullions in the late than in the early ripening strains, but the difference was not marked. Yellow Danvers was the variety used.

TABLE VIII.—ONIONS, COMPARISON OF STOCK.

From whom purchased.	Date of ripening.	Calculated yield per acre.	Remarks.
		Pounds.	
Benson, Maule & Co	Sept. 7	13,563	Fair stock, a few red.
W. Atlee, Burpee & Co	7	13,625	A few red, fair stock.
D. M. Ferry & Co.	1	16,875	Pure, good stock.
J. L. Green	11	18,825	Extra good stock.
J. J. H. Gregory	Aug. 28	12,500	Good stock.

TABLE VIII.—Continued.

From whom purchased.	Date of ripening.	Calculated yield per acre.	Remarks.
		Pounds.	
Peter Henderson & Co	Sept. 11	16,312	Good stock.
Joseph Harris	11	14,250	First class stock.
A. W. Livingstons' Sons	11	16,000	Quite good stock, a few red onions.
Hiram Sibley & Co	Aug. 28	12,500	Quite good stock, a few white onions.
W. W. Rawson & Co	Sept. 11	12,935	Pure and true.
Isaac Tillinghast	Aug. 28	13,687	Good stock.
James Vick	Sept. 11	13,935	True and fine.
Samuel Wilson	1	9,688	Fairly good stock, a few white onions.
Johnson & Stokes	Aug. 28	12,125	Good stock.

Table IX. gives the yields of fertilized plots for both localities. These yields are given separately, as the soil in Medina county was more fertile and gave larger yields than were obtained at the Station. It responded less readily to fertilizers, however, giving in most instances a smaller percentage of gain, but the yield of plots was less uniform. There was a marked uniformity in the yield of the plots at the Station. In both localities a number of plots were left unfertilized The average of these plots was taken and used as a basis of comparison with fertilized plots. The last column shows the gain or loss in the use of the featilizer. In most cases the gain is so slight that it might be attributable to other causes than the use of the fertilizer. Where a loss occurs it is doubtless due to unknown causes, rather than to the harmful effect of the fertilizer, except in the cases of wood ashes and salt. The diminished yield where these substances were used can hardly be accounted for, except on the supposition that they were actually harmful. Salt was apparently beneficial in small quantities, but as might be expected, it was deleterious where more than 1,000 pounds per acre were used. Horse manure did not give as good results as might have been expected, nor is the showing for any fertilizer very satisfactory.

TABLE IX.—ONIONS, YIELDS OF FERTILIZED PLOTS.

Fertilizer used.	Locality.	Yield per acre in pounds.	Gain or loss, as compared with the average of unfertilized plots. + or −.
Bowker's special onion manure, 500 lbs. per acre	Station	22,662	+1,412
	Medina county	36,250	+5,750
Bowker's special onion manure, 1,000 lbs. per acre	Station	24,662	+3,412
	Medina county	28,500	−2,000

TABLE IX.—Continued.

Fertilizer used.	Locality.	Yield per acre, in pounds.	Gain or loss, as compared with the average of unfertilized plots. + or —.
Bowker's special onion manure, 1,500 lbs. per acre	Station	23,562	+2,312
	Medina county	34,250	+3,750
Bowker's special onion manure, 2,000 lbs. per acre	Station	24,935	+3,685
	Medina county	31,812	+1,312
Baker's special onion manure, 500 lbs. per acre	Station	23,750	+2,500
	Medina county	40,000	+9,500
Baker's special onion manure, 1,000 lbs. per acre	Station	24,000	+2,750
	Medina county	28,500	—2,000
Baker's special onion manure, 1,500 lbs. per acre	Station	24,125	+2,875
	Medina county	33,500	+3,000
Baker's special onion manure, 2,000 lbs. per acre	Station	25,187	+3,937
	Medina county	31,500	+1,000
Wood ashes, unleached, 30 bushels per acre	Station	18,687	—2,563
	Medina county	35,000	+4,500
Wood ashes, unleached, 90 bushels per acre	Station	18,000	—3,250
	Medina county	27,000	—3,500
Wood ashes, unleached, 90 bushels per acre	Station	18,875	—2,375
	Medina county	28,000	—2,500
Wood ashes, unleached, 120 bushels per acre	Station	19,625	—1,625
	Medina county	23,000	—7,500
Hen manure, 30 bushels per acre	Station	22,687	+1,437
	Medina county	33,000	+2,500
Hen manure, 60 bushels per acre	Station	21,187	— 63
	Medina county	28,000	—2,500
Hen manure, 90 bushels per acre	Station	23,112	+1,862
	Medina county	31,000	+ 500
Hen manure, 120 bushels per acre	Station	21,687	+ 437
	Medina county	33,000	+2,500
Horse manure, well rotted, 5,000 lbs. per acre	Station	21,687	+ 437
	Medina county	34,000	+3,500
Horse manure, well rotted, 10,000 lbs. per acre	Station	22,625	+1,375
	Medina county	28,000	—2,500
Horse manure, well rotted, 20,000 lbs. per acre	Station	22,750	+1,500
	Medina county	40,000	+9,500

TABLE IX.—Continued.

Fertilizer used.	Locality.	Yield per acre, in pounds.	Gain or loss, as compared with the average of unfertilized plots. + or —.
Agricultural salt, 250 lbs. per acre	Station	21,375	+ 125
Agricultural salt, 500 lbs. per acre	Station	24,750	+3,500
Agricultural salt, 750 lbs. per acre	Station	27,000	+5,750
Agricultural salt, 1,000 lbs. per acre	Station	25,625	+4,375
Agricultural salt, 1,500 lbs. per acre	Station	17,435	—3,815
Agricultural salt, 2,000 lbs. per acre	Station	14,187	—7,063

Thick and Thin Seeding.

Seed of Yellow Danvers was sown thickly and when the plants were large enough thinned to one, two, three, and four inches apart in the row. The results, which are the averages of three series of plots, are given in Table X. But few of the onions were marketable, grown upon the plots where the plants were thinned to one inch apart. Upon very rich soil and in favorable seasons the result might be different. Ordinarily, one and one-half to two inches are perhaps about the proper distances to secure the largest crops of marketable onions.

Distance apart in the row.	Yield per acre—in pounds. Calculated.
One inch	24,250
Two inches	21,819
Three inches	19,630
Four inches	10,639

PEAS.

Peas were sown May 2d, in drills three feet apart. The seed was placed three inches apart in the row and covered with three inches of soil. The work was conducted upon the same plan as that of the previous season. Nearly all of the same varieties were retained and a number of new and some old ones added to the list. The season was very favorable, especially in the arlier part, hence the record of nearly all of the early varieties was uncommonly good. The Early Philadelphia and closely allied strains, under various names, continued much longer in bearing than is usual. The vines from which pickings were made continued in bearing for some time after plants in the same rows, from which no peas were picked, were dead. The last pickings, however, were quite poor, as the pods were not well filled.

Table XI. is designed to show the comparative earliness of varieties named. It does not show the first mature pods found upon the plants of any variety, but shows how many pods were fit to pick at a given date. The first picking was made in every case before any of the peas were too hard to use, and all the pods mature enough to pick at that time were taken. In fact, the pickings were made just as though the peas were intended for market or table use. This method shows just what it is desirable to know about any variety, viz.: the length of season and time of largest picking. According to this method, the earliest variety is the one that shows the greatest number of pods at the first picking and yields its crop in the shortest time. The season being less favorable for the late than the early sorts, the former do not make as good a showing, comparatively, as the latter.

The length of season, or number of days in bearing, given, is undoubtedly too long for some of the early sorts and too short for some of the late, but the length of season seems to be quite variable with most varieties and is influenced greatly by the weather, depth of planting, and time of planting.

Before the picking was commenced twenty-five plants were counted off in each row, and the same plants picked from each time.

TABLE XI.—PEAS, COMPARATIVE EARLINESS.

Name of variety.	First picking—days from planting.	No. of pods from 25 plants.				No. of days in bearing.
		First picking.	Second picking.	Third picking.	Fourth picking.	
American Wonder (A. W. Livingston's Sons)	53	30	43	40	22	18
Andes (O. H. Alexander)	60	180	150	40	....	14
Bliss' Abundance (Peter Henderson & Co.)	70	372	206	....	....	10
Bliss' Everbearing (Peter Henderson & Co.)	70	199	212	....	....	10
Carter's Premium Gem (J. J. H. Gregory)	53	53	83	39	59	18
Cleveland's Rural New Yorker (Rural N. Y.)	50	63	29	44	24	20
Champion of England (A. W. Livington's Sons).	70	260	250	....	....	10
Dwarf Champion of England (J. J. H. Gregory).	70	268	222	....	....	10
Dwarf Marrowfat (A. W. Livingston's Sons)	70	222	285	....	....	10
Early Daniel O'Rourke (W. W. Rawson & Co.).	50	61	22	24	21	20
Extra Early (J. A. Everitt)	50	52	36	37	48	20
Extra Early (Benson, Maule & Co.)	50	71	30	25	17	20
Extra Early (D. M. Ferry & Co.)	50	63	31	35	9	20
Extra Early (W. Atlee, Burpee & Co.)	59	105	106	231	78	21
Extra Early (James Vick)	50	63	21	6	25	20
Extra Early Philadelphia (Hiram Sibley & Co.)	50	50	50	31	12	18
Express (J. J. H. Gregory)	50	60	31	24	30	20
Early Pearl (O. H. Alexander)	50	90	33	7	15	20
Excelsior (C. L. Allen)	50	63	41	52	16	20
First in the Market (A. W. Livingston's Sons).	50	63	23	76	26	20

TABLE XI.—Continued.

Name of variety.	First picking—days from planting.	No. of pods from 25 plants.				No. of days in bearing.
		First picking.	Second picking.	Third picking.	Fourth picking.	
First and Best (D. M. Ferry & Co.)	50	59	24	56	40	20
First and Best (Hiram Sibley & Co.)	50	62	24	33	22	20
First of All (Peter Henderson & Co.)	50	60	32	28	18	20
Family Garden (Benson Maule & Co.)	70	435	66	....	....	10
Garden Pride (J. C. Everitt)	53	116	35	25	50	20
Horsford's Market Garden (Horsford & Pringle)	60	31	67	230	248	20
Cross Imperial and Champion (Horsford & Pringle)	70	334	231	....	....	10
Hoskin's Vermont Wonder (O. H. Alexander)	53	52	84	29	28	18
Improved Stratagem (O. H. Alexander)	70	150	359	....	....	10
Kentish Invicta (D. Landreth & Sons)	53	110	60	....	....	8
Landreth's Extra Early (D. Landreth & Sons)	50	55	26	47	25	20
McLean's Little Gem (A. W. Livingston's Sons)	53	22	59	74	150	18
McLean's Advancer (A. W. Livingston's Sons)	53	20	55	62	114	18
Maud S (J. J. H. Gregory)	50	67	35	28	21	20
Marrowfat (A. W. Livingston's Sons)	70	173	204	....	....	10
No. 3 Cross of American Wonder and Sunrise (O. H. Alexander)	53	46	81	31	44	18
New Atlantic (O. H. Alexander)	60	24	257	187	....	14
No. 10 (O. H. Alexander)	70	117	141	....	....	10
New Pride of the Market (Benson Maule & Co.)	70	218	81	....	....	10
Pride of the Market (W. Atlee Burpee & Co.)	70	214	192	....	....	10
Prince of Wales (Rural New Yorker)	70	394	168	....	....	10
Perpetual	....	....	....	....	....	....
Rival (C. L. Allen)	70	272	226	....	....	10
17th of June (W. W. Rawson & Co.)	50	63	31	29	31	20
Stratagem (D. Landreth & Sons)	70	169	80	....	....	10
Stratagem (Rural New Yorker)	70	150	107	....	....	10
Stratagem (A. W. Livingston's Sons)	70	144	98	....	....	10
Similax (O. H. Alexander)	70	204	338	....	....	10
Tom Thumb (D. M. Ferry & Co.)	53	67	62	17	15	18
Telephone (A. W. Livingston's Sons)	70	173	53	....	....	10
Telephone (D. Landreth & Sons)	70	216	71	....	....	10
Vicks' New Dwarf (O. H. Alexander)	53	62	67	38	36	18
Wm. Hurst (J. J. H. Gregory)	53	48	86	19	6	18
Yorkshire Hero (W. W. Rawson & Co.)	70	403	138	....	....	10

In Table XII. is given the whole number of pods picked from twenty-five vines, also the number of peas. These numbers do not agree very closely with those given in the last report, being larger in most cases, the exceptions being the early sorts. The same remark applies to the weight of pods and of shelled peas. The relative weight of pods and shelled peas appears, however, to be nearly the same for the two seasons.

It will be seen that the relative weight of shelled peas is much smaller in the smooth than in the wrinkled sorts, being 15 to 20 per cent. greater in the latter than in the former, the only exceptions being the early wrinkled sorts; but even they stand higher than the smooth varieties. In some of the late sorts the shelled peas weigh more than the empty pods, but in some of the smooth early sorts the weight of empty pods is more than twice that of the shelled peas.

TABLE XII.—PEAS. COMPARATIVE PRODUCTIVENESS.

Name of variety.	Number of pods from 25 plants.	Number of peas from 25 plants.	Weight of pods in ounces.	Weight of peas in ounces.	Average number of peas per pod.
American Wonder (A. W. Livingston's Sons)	137	739	23⅞	9⅛	5+
Andes (O. H. Alexander)	370	1,302	50	22½	3+
Bliss' Abundance (Peter Henderson & Co.)	578	1,934	73½	36	3+
Bliss' Everbearing (Peter Henderson & Co.)	411	1,419	62	30¾	3+
Carter's Premium Gem (J. J. H. Gregory)	234	1,025	31½	13	4+
Cleveland's Rural New Yorker (Rural New Yorker)	160	814	24¼	9¼	5+
Dwarf Champion of England (J. J. H. Gregory)	490	1,511	77½	37	3+
Dwarf Marrowfat (A. W. Livingston's Sons)	507	1,933	61¼	31⅝	4—
Early Daniel O'Rouke (W. W. Rawson & Co.)	128	583	18⅛	6⅞	4+
Extra Early (J. A. Everitt)	174	854	26⅞	9¾	5—
Extra Early (Benson Maule & Co.)	143	722	21¼	8⅛	5+
Extra Early (D. M. Ferry & Co.)	138	656	20¼	7⅝	5—
Extra Early (W. Atlee, Burpee & Co.)	520	2,875	66⅞	31⅝	5+
Extra Early (James Vick)	115	475	13⅜	6⅛	4+
Extra Early Philadelphia (Hiram Sibley & Co.)	143	664	20½	8	4+
Express (J. J. H. Gregory)	145	667	21¼	6⅝	4+
Early Pearl (O. H. Alexander)	145	634	20⅛	7⅞	4+
Excelsior (C. L. Allen)	172	920	29¼	11¼	5+
First in the Market (A. W. Livingston's Sons)	188	995	32½	11¾	5+
First and Best (D. M. Ferry & Co.)	179	941	29⅝	10½	5+
First and Best (Hiram Sibley & Co.)	141	669	19⅝	7⅛	5—
First of All (Peter Henderson & Co.)	138	652	20⅝	7⅝	5—
Family Garden (Benson Maule & Co.)	501	2,466	61⅜	30⅞	4+
Garden Pride (J. A. Everitt)	226	955	27⅜	10⅞	4+
Horsford's Market Garden (Horsford & Pringle)	576	2,376	72⅛	35¼	4+
Cross Imperial and Champion (Horsford & Pringle)	565	1,956	97¾	44⅝	3+
Hoskins' Vermont Wonder (O. H. Alexander)	193	849	30½	11⅞	4+
Improved Stratagem (O. H. Alexander)	509	2,085	108	44	4+
Kentish Invicta (D. Landreth & Sons)	170	790	21½	9	4+
Landreth's Extra Early (D. Landreth & Sons)	153	792	25⅝	8¾	5+
McLean's Little Gem (A. W. Livingston's Sons)	305	2,022	53⅞	29½	6+
McLean's Advancer (A. W. Livingston's Sons)	251	1,373	42¾	17⅞	5+
Maud S (J. J. H. Gregory)	151	708	22⅝	8½	5+
Marrowfat (A. W. Livingston's Sons)	377	1,844	58¾	30⅛	5—
No. 3 Cross of American Wonder and Sunrise (O. H. Alexander	202	971	34⅝	13⅝	5—
New Atlantic (O. H. Alexander)	468	2,008	64	32⅝	4+
No. 10 (O. H. Alexander)	258	1,259	72½	27⅞	5—
New Pride of the Market (Benson Maule & Co.)	299	1,633	78½	30¾	5+
Pride of the Market (W. Atlee, Burpee & Co.)	406	1,986	95	36⅝	4+
Prince of Wales (Rural New Yorker)	562	1,648	84	39¼	3—
Rival (C. L. Allen)	622	2,386	91¾	44	3+
Seventeenth of June (W. W. Rawson & Co.)	154	714	22⅞	8⅝	5+
Stratagem (Rural New Yorker)	357	1,583	82	35¾	4+
Stratagem (D. Landreth & Sons)	301	1,422	75¾	32¾	4+

TABLE XII.—Continued.

Name of variety.	Number of pods from 25 plants.	Number of peas from 25 plants.	Weight of pods in ounces.	Weight of peas in ounces.	Average number of peas per pod.
Stratagem (A. W. Livingston's Sons)	242	1,365	73¼	30¾	5+
Smilax (O. H. Alexander)	542	2,854	82¾	43¾	4+
Tom Thumb (D. M. Ferry & Co.)	161	785	19¾	7⅝	5—
Telephone (A. W. Livingston's Sons)	226	1,193	61½	27⅛	5+
Telephone (D. Landreth & Sons)	287	1,394	77¾	32½	5—
Vick's New Dwarf (O. H. Alexander)	203	796	30⅜	11¼	4—
Wm. Hurst (J. J. H. Gregory)	159	799	26⅝	8½	5+
Yorkshire Hero (W. W. Rawson & Co)	541	1,911	88	45	3+

Remarks on Varieties.

Of the early sorts, Cleveland's Rural New Yorker, Everitt's, Maule's, Ferry's and Vick's Extra Earlies, Ferry's and Sibley's First and Best, Henderson's First of All, Livingston's First in the Market, Early Pearl, Early Philadelphia, Excelsior, Landreth's Extra Early, and 17th of June, are essentially the same. Some of them may have been grown with greater care than others, but all of those named are good stock, showing careful selection, and all that is claimed for them as to earliness, is true, except that no one of them is the earliest pea in existence, unless it is conceded they are all strains of one variety, in which case the claim may be allowed. The record given shows some slight differences as to earliness and productiveness, but it is by no means certain that another trial would give the same results. Burpee's Extra Early was quite different from the others, being taller, more productive, but nine days later. It was the same as a variety under the erroneous name of Early Philadelphia from the same source.

Stratagem sustains its reputation, and Alexander's Improved Strategem seems really to be an improvement, so far as productiveness is concerned.

Vick's New Dwarf is promising, and may prove to be superior to American Wonder.

Bliss' Abundance is an excellent variety, but Bliss' Everbearing is a misnomer. It is only fairly productive, and yields its crop at two pickings.

For a variety that continues long in bearing and yields heavily, Horsford's Market Garden seems to have no superior. It is unrivaled for family use.

Smilax is very promising, also Early Pearl, if upon further trial it should prove to be as early as it appears to be.

RADISHES.

Radish seed was sown May 16. Owing to the favorable season the crop was excellent. As will be seen by referring to the table the time to marketable maturity is given, but most sorts were edible three or four days earlier. For first early, Olive Rose and New French Breakfast are as good as any. The best varieties on the list for general purpose are Beckert's Improved Chartiers and White Lady Finger. They excel not only in handsome appearance, but in tenderness, crispness and in length of season, and are nearly as early as any.

Name of variety.	Marketable.—No. of days from planting.	Remarks.
Beckert's Improved Chartiers—A. W. Livingston's Sons	27	A fine showy variety, of good quality; remains good a long time before becoming pithy; excellent for summer use.
Early Prussian Globe—D. Landreth & Sons	25	Resembles Olive Rose, but perhaps rather better; becomes pithy very soon.
Early Long Scarlet Short Top—A. W. Livingston's Sons	27	A well known sort, but doubtless superseded by better kinds.
Early Scarlet Turnip—A. W. Livingston's Sons	25	Very tender at first, but remains good only a short time; same as Round Deep Scarlet Turnip.
Early White Turnip—A. W. Livingston's Sons	25	Very small; not desirable.
Earliest Scarlet Erfurt—A. W. Livingston's Sons	22	Remains good only a short time; desirable only for earliness.
Early Deep Scarlet Turnip—D. Landreth & Sons	25	Soon becomes pithy.
Earliest Short Top White Rooted—D. Landreth & Sons	25	Much like Early White Turnip, but rather more dwarf in habit.
Dayton White—A. W. Livingston's Sons	30	Very inferior; threw up flower stalks almost as soon as edible.
Grey Summer—A. W. Livingston's Sons	30	Mixed with a purple sort.
Giant Stuttgart—A. W. Livingston's Sons	40	Quite mild; a good late sort.
Golden Globe—A. W. Livingston's Sons	30	A good summer sort, but apparently the same as Yellow Summer.
Long White Naples—A. W. Livingston's Sons	31	Rather tough, and often ill-shaped.
Market Gardener's Early Long Scarlet—D. Landreth & Sons	27	Apparently the same as Wood's Early Frame.
Mammoth Summer—A. W. Livingston's Sons	30	Threw up flower stalks as soon as edible; very inferior.
New French Breakfast—A. W. Livingston's Sons	25	A good early sort, but becomes pithy soon.
Olive Rose—A. W. Livingston's Sons	25	Remains good only a short time, but very tender at first.
Round Deep Scarlet Turnip—A. W. Livingston's Sons	25	The same as Early Scarlet Turnip.
White Tipped Scarlet Turnip—A. W. Livingston's Sons	25	Very pretty, tender, but soon becomes pithy.
White Tipped Scarlet—D. Landreth & Sons	25	Same as the above.
White Lady Finger—D. Landreth & Sons	27	Very beautiful, clear white, tender, crisp; an excellent variety.
Wood's Early Frame—A. W. Livingston's Sons	27	An excellent long rooted sort.
Yellow Summer—A. W. Livington's Sons	30	Excellent for summer use; remains edible a long time.

TOMATOES.

Seed was sown in the hot bed April 20. The plants were once transplanted and set in the field June 2. The tomato is quite variable as to earliness; the variety that is earliest one season may not be so the next. If the order of ripening, as given in Table XIII., and that given in Table IX. of the last report are compared, there will be found to be much diversity. Perhaps the method pursued in this report of giving the number of ripe fruits found at the time of each picking is less objectionable than that of merely giving the date of the first ripe fruit, but it is very doubtful if any method whatever can be pursued that will give anything more than an approximation. With none but well established varieties, brought to a high degree of fixity and uniformity by selection, it is possible to determine earliness. Most of the so-called varieties of tomatoes are merely strains that have not become fixed by thorough selection, hence it is impossible to affirm anything whatever concerning them. It will be seen that Acme seed taken from the first ripe fruit, produced plants that gave fruit earlier than that taken from the last ripe fruit. Doubtless, the plan of saving seed from the first good fruit, or from plants that give the most early fruit, is a good one. It has been observed that the finest, if not the earliest fruit is secured by this method of selection. There was no difference observed between seed saved from fruit affected by rot, and that saved from sound fruit. Seed saved from green fruit failed to germinate.

TABLE XIII.—TOMATOES.

Name of variety.	First ripe fruit.	Number ripe August 14.	Number ripe August 21.	Number ripe August 31.	Average weight in ounces	Average circumference in inches.
Acme—Seed from first ripe fruit	Aug. 3	26	27	53	5	6½
Acme—Extra selected	3	17	17	42	5	8¼
Acme—Seed from last ripe fruit	10	5	16	22	4½	8¼
Acme—D. Landreth & Sons	11	17	16	28	5	8
Alpha—Frank Ford & Son	2	37	49	39	3½	7½
Advance—Frank Ford & Son	3	26	24	74	3¾	7¾
Canada Victor—J. J. H. Gregory	6	30	8	44	4	7¼
Climax—W. Atlee, Burpee & Co	8	14	7	23	5	8¼
Challenge	12	3	3	9	6	9
Cardinal—Peter Henderson & Co	10	5	3	6	5	8
Essex Hybrid—Peter Henderson & Co	10	12	11	12	5	7½
Early Richmond—D. Landreth & Sons	5	32	15	26	4¾	8½
Favorite—A. W. Livingston's Sons	12	17	10	12	6	9
Golden Queen—A. W. Livingston's Sons	10	11	6	17	6	9
Mayflower—Peter Henderson & Co	10	12	5	12	5	8
Market Champion—Johnson & Stokes	10	11	2	12	5	8
Optimus—D. M. Ferry & Co	10	24	17	20	5	7½
Paragon—A. W. Livingston's Sons	10	11	10	23	5	8
Perfection—A. W. Livingston's Sons	8	11	7	7	5¼	8
Perfection—Seed from first ripe fruit	3	8	12	28	5½	8
Perfection—Seed from last ripe fruit	6	13	6	12	5	7
Precursor—Benson, Maule & Co	8	11	7	13	4½	8
Queen—Peter Henderson & Co	4	6	9	25	5	8½

TABLE XIII.—Continued.

Name of variety.	First ripe fruit.	Number ripe August 14.	Number ripe August 21.	Number ripe August 31.	Average weight in ounces.	Average circumference in inches.
Rochester—Hiram Sibley & Co	12	5	2	8	6	10
Standard Market and Shipping—J. A. Everitt	8	24	9	14	5	8½
New Tree Tomato—Johnson & Stokes	21	....	....	....	....	......
Golden Trophy—D. Landreth & Sons	10	14	12	29	6	9
Trophy—D. Landreth & Sons	12	9	9	20	6	9
Wonder of Italy	12	7	10	47	2	5

Notes on Varieties.

Advance.—Rather larger and not so rough as the Alpha, but not large and smooth enough to become a profitable market variety. It may be profitable in some sections, but in this market the fruit could not be sold at any price as soon as the large fruited sorts ripen.

Climax.—A fine, smooth fruited variety, much resembling the Favorite.

Challenge.—Fruit large and irregular. Has no especial merits.

Cardinal.—Fruit of good form and color, but rots quite as badly as the Acme. Not superior to that variety, except for markets where its color is in its favor.

Market Champion.—Resembles the Cardinal, and whether identical or not, is a fine variety or strain.

Mayflower.—Fruit often irregular. Has not come up to the promises made for it.

Optimus.—Fruit quite smooth, resembling the Perfection in color. It may be identical with that variety, but is hardly superior to it.

Precursor.—Fruit quite irregular. Scarcely better than Canada Victor.

Queen.—Quite irregular. Fruit mostly unsalable.

Rochester.—Fruit quite large, but somewhat irregular, and ripens unevenly.

Standard Market and Shipping —Quite regular and smooth, but resembles the Perfection.

New Tree Tomato.—Identical with the Upright Red. Fruit too rough and late.

Wonder of Italy.—Fruit small and worthless.

SEED TESTS.

BY W. S. DEVOL.

The testing of the vitality of seeds was done as near as it was possible during the season of planting, (excluding tests given in Table II.), beginning February 24th, and ending August 10th. The plan of conducting the germinations at this time was adopted that any differences in vitality that might arise from the time of year and age of seed might be eliminated, and the comparison of tests thereby made as just as it is possible to make it.

The total number of germinations made in the period intervening between the above mentioned dates was 887, as follows: Corn sent to the Station for testing, 290 samples; varieties of field corn used in field experiments from specimen ears sent to the Station, 82 tests; varieties of sweet corn used in field experiments, 40 tests; garden seeds, and a few miscellaneous seeds, 505 tests.

All the tests were made in the germinater described in our first annual report. The temperature for the germination of corn was 82° to 92° Fahrenheit. For other seeds it was kept between 78° and 85° Fahrenheit.

SEED CORN.

Corn harvested in 1884 was housed in better condition than it had been for two or three years before, and withstood the cold of the winter better, coming out at seeding time mostly uninjured. Better care, too, was taken in curing and keeping seed corn than formerly, as evinced by the remarks accompanying seed sent to the Station for testing.

Two hundred and sixty tests of seed corn were made during the spring of 1885, for persons in all parts of Ohio, and a few from without the State. These tests are given in detail in Table I.

In the first column in the left is the number of test as recorded at the Station. Following this in order are given: the name of the variety of corn; the color of the grain, "Y" yellow, "W" white, "R" red, "S" striped or spotted; the name and address of the person sending the corn; the number of hours from the time the test was begun until the first kernel was observed to have sprouted; the number of days from the time the sample was put in the tester until the last seed to germinate had done so; the per cent. of seed that germinated; the number of ears from which the sample was taken; the place on the ears from which the kernels were taken; and remarks concerning the manner in which the corn had been cured and kept.

An average of over 95 per cent. germinated of the samples taken from that which had been thoroughly dried by being spread thinly upon a floor, placed on shelves, ricked up, hung up by the husks, or some such manner, while of the samples taken from the crib, an average of but a little over 90 per cent. germinated. This is equivalent to the saving of over 5 per cent. of the seed in planting, besides, what is of much more importance, the greater certainty of the corn being evenly distributed over the field when it comes up, for the poorer the seeds the more variable will be the number of stalks in a hill.

The difference in the vitality of the seed due to different ways of curing and keeping the corn may be made evident by selecting a few examples from the table.

Take samples of Leaming corn, Nos. 1487–9, left in the shock in the field until February, at which time it was tested. The average germination from the three tests, from the tips, middles and butts of the same fifty ears, was 81.3 per cent., and from the middle of the ear, which represents the greater part of it, only 72 per cent. The three succeding tests (Nos. 1490–2), made at the same time, are of the same variety, grown near the above, but properly cured in October. An average of 98.7 per cent. germinated, and 100 per cent. from the middle of the ear, a difference of 28 per cent. from the middle of the ear. Compare Nos. 1469–71 with Nos. 1472–4. The treatment of both lots was the same until it was cribbed in the fall, when the corn from which the three first named tests were made, was spread thinly in a loft at the same time as that from which the last named tests were made was put in the crib. In these there was a difference of 20 per cent. in the germinations from the middle of the ears.

It is evident to any one who has given the matter attention, that we do not as a rule, in curing, storing and keeping our seed corn, take the care necessary to insure the best germination, even when planted under the most favorable circumstances. Nor will this care be given until we are convinced that it will pay to do so. Is it good economy to take the time and trouble necessary to select, thoroughly dry and properly store the corn that is to be used for seed? In1884 over 2,600,000 acres were planted to corn in Ohio. Assuming five quarts of seed to have been required per acre to plant this, it required over 400,000 bushels of seed corn. From the table of germinations it was found that over 5 per cent. more of corn that was properly cured germinated than that simply kept in cribs. In other words it would require over 5 per cent. more of seed from the crib than of the cured seed to get the required number of stalks on a given area of ground. It would therefore require over 20,000 bushels more for seed, than if it *were all properly cured*, and at the average market price of corn for the year, cost over $9,000. But an average of 5 per cent. difference in vitality required the planting of not only the 5 per cent. of extra seed to insure the proper number of stalks, but much more, say another 5 per cent. to insure the proper distribution of the stalks. This will raise the cost of seed to $18,000. But seed corn sells for more than the average price of corn, often four and five times the price. Suppose that on an average it was twice as high, the extra cost of seed is thus seen to be $36,000 per year in Ohio alone.

But this not all. It is, indeed, but a small part of the expense caused by poor or inferior seed. The cost of replanting, the delay occasioned by this often resulting in an entire failure of the crop, the expense of thinning where too many kernels had been planted to insure enough stalks in the hill, and the poor corn thrown upon the market from uneven ripening and mixing caused by replanting makes the cost to the farmers of the State far more than at first appears. Compared with the cost from neglecting to do so, the expense of properly curing and storing the necessary amount of corn for seed, is quite insignificant.

SEED TESTS.—TABLE I.—SEED CORN SENT TO THE STATION FOR TESTING, 1885.

Test number.	Variety.	Color of grain.	Tested for –	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears seed taken from.	Place on the ear.	Remarks.
1460	Big Yellow	Y	A. T. Millard, Springboro	21	2	98	100	T	Hung up in October in a warm room.
1461	"	Y	same	21	2	99	100	M	
1462	"	Y	same	21	3	100	100	B	
1463	"	Y	same	21	2	99	100	T	Ricked up in November in a warm room.
1464	"	Y	same	21	2	95	100	M	
1465	"	Y	same	21	3	95	100	B	
1466	Yellow Dent	Y	F. Beneke, West Alexandria	21	3	98	100	T	Selected in November and kept dry.
1467	"	Y	same	21	2	98	100	M	
1468	"	Y	same	21	2	99	100	B	
1469	Leaming	Y	Jas. Scott, Jr., Adams Mills	17	3	93	100	T	Dried in the fall in a loft.
1470	"	Y	same	17	2	100	100	M	
1471	"	Y	same	17	2	100	100	B	
1472	"	Y	same	17	3	96	100	T	From crib.
1473	"	Y	same	18	3	80	100	M	
1474	"	Y	same	17	3	95	100	B	
1475	Scott's Yellow Dent	Y	same	17	3	98	100	T	Dried in a loft in the fall.
1476	" "	Y	same	17	2	100	100	M	
1477	" "	Y	same	18	2	100	100	B	
1478	" "	Y	same	18	2	97	100	T	From crib.
1479	" "	Y	same	16	3	94	100	M	
1480	" "	Y	same	17	2	100	100	B	
1481		Y	Frank J. Mishler, Magadore	16	1	100	50	T	Dried in a warm place, and kept in a dwelling house.
1482	Scott's Yellow Dent	Y	same	16	1	100	50	M	
1483	" "	Y	same	18	2	100	50	B	

1484	Leaming	Y	A. N. Sutliff, Greenwich	17	2	96	100	T	Cured near a warm stove pipe.
1485	"	Y	same	17	2	97	100	M	
1486	"	Y	same	16	2	94	100	B	
1487	"	Y	Jas. Boyd, Plain City	16	4	78	50	T	Taken from shock in February.
1488	"	Y	same	16	2	72	50	M	
1489	"	Y	same	16	4	94	50	B	
1490	"	Y	Dr. J. Converse, Plain City	19	2	96	50	T	Gathered in October, and well kept.
1491	"	Y	same	18	2	100	50	M	
1492	"	Y	same	19	2	100	50	B	
1493	Early Mammoth	Y	A. E. Wiseman, Covington	19	2	93	95	T	Kept in a loft without fire.
1494	" "	Y	same	19	2	100	100	M	
1495	" "	Y	same	20	2	95	100	B	
1496	Milligan	Y	A. A. Wise, Bellaire	18	2	100	100	T	
1497	"	Y	same	18	2	98	100	M	
1498	"	Y	same	19	3	98	100	B	
1499	Leaming	Y	W. J. Mathie, New Berlin	22	2	100	100	T	Dried in the cellar.
1500	"	Y	same	21	2	100	100	M	
1501	"	Y	same	21	2	100	100	B	
1502	Yellow Dent	Y	Frank B. Stafford, New Carlisle	16	3	96	100	T	
1503	"	Y	same	16	2	97	100	M	
1504	"	Y	same	18	2	98	100	B	
1505	....	W	T. H. Housell, Blanchester	16	2	100	....	M	
1506	....	Y	same	16	3	100	....	M	
1507	Ohio Prolific	W	Geo. F. Parrett, Greenfield	19	2	99	100	T	
1508	"	W	same	19	1	99	100	M	
1509	"	W	same	19	4	98	100	B	
1510	Leaming	Y	Alva. A. Wise, Bellaire	19	1	100	100	T	From crib.
1511	"	Y	same	19	2	100	100	M	
1512	"	Y	same	19	4	99	100	B	
1513	"	Y	Hiram B. Hossler, Chardon	19	4	100	50	T	Hung in the dwelling by part of the husk.
1514	"	Y	same	19	4	100	50	M	
1515	"	Y	same	19	2	100	50	B	
1516	....	W	Jas. D. Allison, Cherry Fork	23	3	97	100	T	Kept in a cold room in the dwelling.
1517	Leaming	W	same	23	3	100	100	M	
1518	"	W	same	23	3	99	100	B	
1519	Hackberry (a cross)	Y	Emanuel Eckler, Elyria	18	3	97	100	T	Spread one foot deep on a slab rack.
1520	" "	Y	same	24	3	98	100	M	
1521	" "	Y	same	24	3	96	100	B	

SEED TESTS.—TABLE I.—Continued.

Test number.	Variety.	Color of grain.	Tested for—	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears seed taken from.	Place on the ear.	Remarks.
1522	White Dent	W	J. M. Merrill, Friendship	24	3	99	100	T	From crib.
1523	"	W	same	24	2	100	100	M	
1524	"	W	same	24	3	99	100	B	
1525	Leaming	Y	J. B. Conn, Hackney	24	3	99	100	T	Ricked in a warm room.
1526	"	Y	same	24	2	100	100	M	
1527	"	Y	same	21	3	99	100	B	
1528	Mixed Varieties	....	D. W. Terrell, New Antioch	21	3	89	100	T	From crib.
1529	" "	....	same	21	2	91	100	M	
1530	" "	....	same	21	3	96	100	B	
1531	Improved Clarage	Y	Wm. Henderson, Sabina	20	4	94	100	T	Kept in dwelling.
1532	" "	Y	same	18	2	100	100	M	
1533	" "	Y	same	24	4	95	100	B	
1534	Cassiday	Y	J. B. Heim, Minerva	24	4	93	100	T	Dried on shelves in dwelling.
1535	"	Y	same	24	2	99	100	M	
1536	"	Y	same	24	4	92	100	B	
1537	Leaming	Y	John L. Zollinger, Thornville	22	4	95.6	100	......	Scattered on barn floor.
1538	Golden Beauty	Y	P. A. Graham, Xenia	25	4	87.7	49	T	Dried by fire in smoke-house, then hung in cellar.
1539	" "	Y	same	25	4	91.8	49	M	
1540	" "	Y	same	25	4	90	50	B	
1541	Chester County	Y	same	22	3	98	50	T	Hung in crib until frost, then hung in cellar.
1542	" "	Y	same	22	3	100	50	M	
1543	" "	Y	same	22	3	100	48	B	
1544	Leaming	Y	L. W. Skipton, Waterford	22	3	96	100	T	Kept in vacant room in dwelling.
1545	"	Y	same	23	3	100	100	M	
1546	"	Y	same	22	2	100	100	B	

1547	....	Y	L. S. Culp, Millersport	20	3	94	100	T	
1548	Leaming	Y	same	20	2	99	100	M	
1549	"	Y	same	20	2	100	100	B	
1550	"	Y	H. A. Weber, Columbus	24	4	98	100	M	Kept on shelves over piggery.
1551	Miller	W	same	23	4	98	100	M	
1552	Leaming	Y	same	22	3	96	100	M	From crib.
1553	Watkin's White	W	F. M. Watkins, Collett, Ind.	22	5	92	100	T	Dried in spare room in dwelling, then ricked in same place.
1554	" "	W	same	22	3	98	100	M	
1555	" "	W	same	22	5	100	100	B	
1556	Leaming	Y	N. H. Tillman, Arcanum	18	2	99	100	T	Hung up in September by the husk.
1557	"	Y	same	20	2	98	100	M	
1558	"	Y	same	19	4	99	100	B	
1559	Clarage	Y	Lewis Legg, Clintonville	21	3	100	100	T	
1560	"	Y	same	21	3	98	100	M	
1561	"	Y	same	21	3	92	100	B	
1562	Pride of the North	Y	A. E. Beals, West Andover	22	3	93	100	T	From crib.
1563	" "	Y	same	22	3	95	100	M	
1564	" "	Y	same	22	5	93	100	B	
1565	Bennett	R	Geo. Watts, Perry	24	5	72	100	T	From crib.
1566	"	R	same	23	3	95	100	M	
1567	"	R	same	23	5	98	100	B	
1568	Goard seed	Y	same	24	5	73	100	T	From crib.
1569	"	Y	same	24	3	73	100	M	
1570	"	Y	same	24	3	92	100	B	
1571	Penn. State Premium	Y	Thos. Mikesell, Wauseon	19	3	96	100	T	Kept on top of oats in the bin.
1572	" "	Y	same	19	3	100	100	M	
1573	" "	Y	same	19	3	96	100	B	
1574	" "	Y	same	18	2	90	....	....	Gathered while in the milk stage and left exposed, (sprouts strong.)
1575	Leaming	Y	W. S. Orr, Glencoe	19	3	98	100	T	Well dried in the fall.
1576	"	Y	same	19	3	99	100	M	
1577	"	Y	same	19	3	100	100	B	
1578	....	Y	same	18	2	100	33	T	Well dried in the fall.
1579	Leaming	Y	same	18	2	100	33	M	
1580	"	Y	same	18	2	100	33	B	
1581	Mammoth Prolific (Sweet)	...	S. W. Hurst, Chillicothe	19	6	91	....	......	
1582	Livingston's (Sweet)	...	same	19	6	66	....	......	
1583	Egyptian (Sweet)	...	same	19	3	95	....	......	

SEED TESTS.—TABLE I.—Continued.

Test number.	Variety.	Color of grain.	Tested for—	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears seed taken from.	Place on the ear.	Remarks.
1584	Leaming	Y	H. H. Wheeler, Ridgeville	19	3	84	100	T	Spread on granary floor.
1585	"	Y	same	19	5	91	100	M	
1586	"	Y	same	19	3	100	100	B	
1587	"	Y	same	23	5	84	100	T	From crib.
1588	"	Y	same	22	3	94	100	M	
1589	"	Y	same	24	5	69	100	B	
1590	"	Y	Jos. Atkinson, Pataskala	22	4	90.9	99	T	
1591	"	Y	same	22	4	97	100	M	
1592	"	Y	same	21	4	97	100	B	
1593		Y	C. B. Lewis, Clifton	21	4	91	100	T	Dried on shelves in a room where there was a fire.
1594	Leaming	Y	same	20	3	99	100	M	
1595	"	Y	same	21	5	99	100	B	
1596		W	same	22	5	85	100	T	Dried in barrels in a room where there was a fire.
1597	Leaming	W	same	22	5	91	100	M	
1598	"	W	same	21	5	100	100	B	
1599	"	Y	The Station		3	98	50	M	Station store room.
1600		W	H. A. Weber, Columbus	20	2	100	4	M	Dried between joists in barn.
1667	Farmer's Favorite	Y	S. E. Williamson, Hooker	22	2	99	100	T	Dried in fall and kept in barn.
1668	" "	Y	same	22	2	100	100	M	
1669	" "	Y	same	26	2	100	100	B	
1670	Leaming	Y	Huse Bone, Lebanon	22	2	94	100	T	From crib 6 feet wide, lath on one side.
1671	"	Y	same	21	2	99	100	M	
1672	"	Y	same	23	2	99	100	B	
1673	"	Y	same	22	2	98	100	T	Piled 4 feet deep in a loft.
1674	"	Y	same	22	2	100	100	M	
1675	"	Y	same	21	2	100	100	B	

1676	Improved Clarage	Y	R. H. Morrow, Washington C. H	21	2	98	100	T	Spread 5 inches deep on floor.
1677	" "	Y	same	21	2	99	100	M	
1678	" "	Y	same	21	2	97	100	B	
1679	Leaming	Y	Daniel Myers, Troy	20	2	86	100	T	
1680	"	Y	same	20	2	67	100	M	
1681	"	Y	same	23	2	86	100	B	
1682	"	Y	Jas. O. Thomas, Raymonds	20	1	100	100	T	Hung up by husk and dried and kept from frost.
1683	"	Y	same	19	2	97	100	M	
1684	"	Y	same	19	2	99	100	B	
1685	Pride of the North	Y	J. A. Stokes, Clyde	19	2	98	100	T	
1686	" "	Y	same	19	1	95	100	M	
1687	" "	Y	same	19	2	100	100	B	
1688		Y	Amos Shinn, Ridge	19	2	98	100	M	
1689	Pride of the North	Y	same	22	2	100	100	B	
1690		W	same	19	2	98	100	M	
1691	Pride of the North	W	same	21	2	97	100	B	
1692	Leaming	Y	W. M. McDill, Morning Sun	21	2	99	100	T	
1693	"	Y	same	19	1	100	100	M	
1694	"	Y	same	21	2	97	100	B	
1695	"	Y	Orlando Trotter, Layman	21	2	100	100	T	From crib.
1696	"	Y	same	20	2	100	100	M	
1697	"	Y	same	21	2	98	100	B	
1698	Leaming × Montgomery	Y	Chas. W. Haldy, Camp Chase	21	2	99	100	T	
1699	" "	Y	same	19	3	100	100	M	
1700	" "	Y	same	.....	3	99	100	B	
1701		Y	O. W. Scott, Camp Chase	......	3	96	100	T	Selected in fall and dried over driveway in barn.
1702	Leaming × Montgomery	Y	same	19	2	100	100	M	
1703	" "	Y	same	20	3	98	100	B	
1704	Gourdseed	Y	Alex. Simpson, Carrollton	21	3	94	100	T	Dried in warm room, then put in outbuilding.
1705	"	Y	same	21	2	99	100	M	
1706	"	Y	same	21	4	93	100	B	
1707	Leaming	Y	Geo. W. Dozer, Deavertawn	21	4	97	100	T	Hung by husk in kitchen loft.
1708	"	Y	same	20	2	99	100	M	
1709	"	Y	same	22	4	99	100	B	
1710	Golden Yellow	Y	A. J. Brelsford, Fletcher	22	6	83.3	95	T	Dried on a scaffold in barn.
1711	" "	Y	same	22	4	70.5	95	M	
1712	" "	Y	same	22	4	99	95	B	
1713	Yellow Acme	Y	D. S. Aiken, Northwood	22	2	94	100	M	From crib.

TABLE I.—SEED TESTS.—Continued.

Test number.	Variety.	Color of grain.	Tested for—	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears seed taken from.	Place on the ear.	Remarks.
1714	Yellow Acme	Y	D. S. Aikin, Northwood	22	2	100	100	T	Hung up by husk.
1715	" "	Y	same	22	2	99	100	M	
1716	" "	Y	same	22	4	100	100	B	
1717		Y	J. F. Henning, Wilkinsburg, Pa.	22	4	98	50	T	Kept in cellar in drying frame.
1718	Yellow Acme	Y	same	22	2	100	50	M	
1719	" "	Y	same	22	4	98	50	B	
1720	" "	Y	same	22	2	88	50	T	From crib.
1721	" "	Y	same	22	2	98	50	M	
1722	" "	Y	same	22	2	96	50	B	
1723		Y	J. Q. Baker, Lebanon	23	2	59	100	M	From crib.
1724	Yellow Acme	W	same	22	2	75	100	M	From crib.
1725	" "	W	same	20	2	97	100	M	Dried over stove then put in open barrels.
1726	Evergreen (Sweet)	...	same	20	2	95	100	M	
1727	Leaming	Y	E. D. Wheeler, Springfield	20	2	95	100	T	Hung by husk in carriage house.
1728	"	Y	same	19	2	98	100	M	
1729	"	Y	same	19	5	99	100	B	
1730		Y	Phillip Erf, Monroeville	23	5	64	100	T	Husked in December, cribbed.
1731	Leaming	Y	same	23	5	52	100	M	
1732	"	Y	same	22	5	74	100	B	
1733	Early Hackberry	Y	N. C. Johnson, Bedford	18	4	100	......	......	Shelled in fall and kept in exposed room.
1734	Leaming	Y	L. Gillilan, Jackson	18	4	95	100	T	
1735	"	Y	same	17	3	100	100	M	
1736	"	...	same	......	3	98	100	B	
1737	Henry	W	same	18	3	98	100	T	
1738	"	W	same	18	3	98	100	M	
1739	"	W	same	18	4	100	100	B	

1740	Decker	Y	J. K. Miller, Millersport	18	4	100	100	T	Kept in loft over crib.
1741	"	Y	same	18	3	98	100	B	
1742	Leaming	Y	Thomas McKee, New Carlisle	18	3	100	100	T	Hung up till cold weather, then put in barrels in dwelling.
1743	"	Y	same	18	3	100	100	M	
1744	"	Y	same	......	5	92	100	B	
1745	Einsel	Y	Henry Baumgardner, Lancaster	24	3	95	100	T	Kept in loft over crib.
1746	"	Y	same	23	4	100	100	M	
1747	"	Y	same	23	4	98	100	B	
1748	———	S	W. C. Pinkham, Loveland	23	4	88	50	T	Dried in dry house, then kept in loft of outbuilding.
1749	Einsel	S	same	23	3	98	50	M	
1750	"	S	same	23	4	98	50	B	
1751	Improved Clarage	Y	Emmett Mix, Avenue	21	2	68	100	T	Kept in loft over crib.
1752	" "	Y	same	20	2	90	100	M	
1753	" "	Y	same	22	3	64	100	B	
1754	" "	Y	same	21	3	89	100	T	Kept in loft over crib.
1755	" "	Y	same	21	2	98	100	M	
1756	" "	Y	same	20	2	94	100	B	
1757	Leaming	Y	Luther Neer, Catawba	23	3	94	100	T	Dried on barn floor, then kept in barrels in barn.
1758	"	Y	same	23	3	97	100	M	
1759	"	Y	same	23	3	95	100	B	
1760	Heckman	Y	S. E. Minnick, Potsdam	19	4	94	50	T	Hung up by husk in dwelling.
1761	"	Y	same	19	2	100	50	M	
1762	"	Y	same	21	2	100	50	B	
1763	———	Y	John Gould, Aurora	22	4	99.5	....	....	
1764	Common Yellow	Y	James Inichen, Port Clinton	22	2	82	100	T	From granary.
1765	" "	Y	same	21	2	95	100	M	
1766	" "	Y	same	23	4	98	100	B	
1767	" "	Y	same	21	4	98	100	T	Kept on the floor over kitchen.
1768	" "	Y	same	20	2	98	100	M	
1769	" "	Y	same	22	2	98	100	B	
1770	Golden Dent	Y	same	21	4	86	100	T	Kept over piggery.
1771	" "	Y	same	19	2	95	100	M	
1772	" "	Y	same	20	2	92	100	B	
1773	———	...	Ed. Harrison, Columbus	20	3	95	100	T	From barn.
1774	Golden Dent	Y	same	20	2	100	100	M	
1775	" "	Y	same	20	2	100	100	B	
1776	Leaming	Y	J. S. Funk, West Liberty	20	2	94	100	M	Kept in warm loft.
1777	———	Y	....	20	3	100	15	......	From crib.
1778	Calico	S	....	22	3	100	....	......	From crib.
1779	———	W	....	22	3	68	....	......	From shock.

SEED TESTS.—TABLE I.—Continued.

Test number.	Variety.	Color of grain.	Tested for—	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	Number of ears seed taken from.	Place on the ear.	Remarks.
1780	——	Y	John Gould, Aurora	19	6	95.5	......	......	
1781	Improved Clarage	Y	Emmett Mix, Avenue	19	3	85	......	......	Exposed in open crib.
1788	——	Y	A. B. Zollars, Napoleon	19	3	98	100	T	
1789	Improved Clarage	Y	same	19	3	100	100	M	
1790	" "	Y	same	19	6	100	100	B	

CURING AND KEEPING CORN.

Some experiments were made at the Station to ascertain the effect upon its vitality of different methods of keeping corn. The experiments, however, were quite incomplete and somewhat unsatisfactory.

The materials from which the selections were to be made were so few that it was found impossible to make any satisfactory tests upon modes of curing. One lot of flint corn consisting of several varieties, and six lots of yellow dent (Leaming) corn were selected the middle of December, 1884, and placed under different conditions, there to remain and be tested at intervals throughout the winter and spring. The lot of flint corn was taken from an open loft over a piggery where it had lain spread a few inches deep since it was husked early in November. The Leaming variety was all taken from one bin, where it had been in a pile several feet deep since the early part of November.

In the table given below (Table II), lot A is the flint varieties; all the others are of the Leaming variety of dent. Lots A and B were together put in a barrel in a dry basement cellar where the temperature fell to 4° or 5° below freezing twice during the winter, Lot C was placed on laths between joists in the ceiling of the same cellar. Lot D was placed on laths in a similar manner, but over the boiler used for heating the green-houses, where it is always very dry and warm, the temperature often rising to 100°. The corn was placed at a distance of three and a half feet above the boiler. Lot E was put in a box with openings in the sides to admit of the same circulation of air and variation of temperature as would take place in the bin in which it was placed with three or more feet of corn on all sides. Lot F was hung up, each ear by itself, where it was freely exposed to the winds and changes of temperature, but protected by a roof from rain and snow. Lot G was buried in a vineyard, three inches deep; the soil was a somewhat gravelly clay loam, with a southern exposure, sloping enough to quickly carry off all surface water.

In the table, the dates at the head of the columns indicate the time at which the tests were begun, and the figures in the columns the per cent. of seeds that germinated in the tests begun at those dates. The results of these tests show that corn properly cured and kept dry is not apt to receive very great injury from the ordinary variations in temperature of Central Ohio. The lot exposed (F), appears to have been injured to some extent, as shown in the variously increasing and decreasing per cents. of germinated seeds in the tests of the series. In buried lot (G) there was a rapid diminution of vitality until it all perished. On the 16th of March, the kernels were more or less blackened and decayed, and on the 13th of April, no kernels could be found that appeared to be sound.

SEED TESTS.—TABLE II.—CORN KEPT UNDER DIFFERENT CONDITIONS.

	Dec. 18.	Jan. 8.	Jan. 21.	March 16.	April 13.	April 20.	June 29.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
A	98	....	96	....	....	100	....
B	99	....	97	....	....	100	....
C	98	....	99	....	....	99	99
D	98	....	98	....	....	97	98
E	98	99	100	94	99	....	98
F	99	92	97	98	95	....	91
G	96	78	42	0	0	....	....

DUPLICATE GERMINATIONS.

As shown in the table, there appears to be no loss of vitality from a reasonable length of time after the corn is harvested until about the time for seeding, in corn that is properly cured. The same table may serve to show a series of duplicate tests of germinations.

Thus lots B to G, inclusive, were all of the same variety of corn (Leaming), taken from the same bin at the same date. The greatest difference in the per cent germinated in the tests of the first date was 3 per cent. between lot G which was the lowest, and lots B and F which gave the highest germinations. The averages of the differences in per cent. germinated in these six tests was but 1.67 per cent.

The widest differences in the per cent. germinated in the five lots B to F, inclusive, for the whole series of tests are found in lot F. In the series for this lot there is a decrease of 7 per cent. from the germination of December 18th, to that of January 8th; then there is an increase in the per cent. germinated in the next two tests, then a decrease to the last which is 8 per cent. lower than the first test.. Lots C and D show the least variation for the whole series, each varying but 1 per cent. Comparing the series of tests in each lot (B to F, inclusive), with the first test the respective lots give a series of 23 duplicates, and show an average difference in germination of a little less than 1.7 per cent. Comparing them as above, and also all the tests of each date with the best results for that date, they give a series of 46 duplicate germinations, and show an average difference of but a little over 1.7 per cent. in the number of seed germinated.

VARIETIES OF CORN PLANTED AT THE STATION.

In Table III are given the germination tests of the varieties of field corn used in field experiments.

In the column, "color of grain," the letter "Y" signifies that the grain is ofa yellow color; this includes the yellow white-cap varieties as well as the various shades of yellows. "W," signifies white; "R," red, and "S," striped or spotted. In the next column to the right, "D," signifies that it is a dent variety, and "F," that it is a flint variety. In the column, "number of ears," is given the number of ears from which each sample tested was taken.

These tests were from specimen ears sent to the Station by the individuals and seedsmen indicated.

An average of 88.7 per cent. germinated of all the corn tested, the results of which are shown in the table; of the dent varieties 88.1 per cent. germinated, and of the flint varieties 92.7 per cent. germinated. In 42.7 per cent. of the tests every kernel sprouted. In 74.4 per cent. of the tests, 90 per cent. or more, of the kernels sprouted.

SEED TESTS.—TABLE III.—VARIETIES OF FIELD CORN USED IN EXPERIMENT PLOTS.

Test number.	Variety.	Color of grain.	F—Flint. D—Dent.	Received from—	Number of ears.	Germinated—per cent.
1601	Large Yellow	Y	F	Peter Henderson & Co., New York, N. Y	2	95
1602	Chester Co. Mammoth	Y	D	same	2	100
1603	Queen of the Prairie	Y	D	same	2	100
1604	Golden Dew-drop	Y	F	same	2	100
1605	Longfellow	Y	F	same	2	95
1606	Compton's Early	Y	F	same	2	85
1607	King Phillip	R	F	same	2	90
1608	Mammoth White Surprise	W	D	same	2	95
1609	Leaming	Y	D	same	2	100
1610	Farmer's Favorite	Y	D	same	2	100
1611	White Flint	W	F	same	2	100
1612	Compton's Early	Y	F	same	2	90
1613	Golden Beauty	Y	D	same	2	100
1614	Lackawaxen	Y	D	A. E. Blount, Fort Collins, Col	1	100
1615	Waushakum	Y	F	same	1	100
1616	Pride of the North	Y	D	same	1	100
1617	——	S	D	D. W. Terrell, New Antioch	3	96.6
1618	——	R	D	same	3	96.6
1619	Scott's Yellow Dent	Y	D	Jas. Scott, Jr., Adams Mills	3	100
1620	Union Co. White	W	D	W. M. Woodworth, Irwin	2	60
1621	Golden Blossom	Y	D	same	3	86.6
1622	Hill's Best	Y	D	same	1	100
1623	Maryland Dent	Y	D	same	1	6
1624	Golden Dent	Y	D	B. P. Mann, East Plymouth	4	90

SEED TESTS.—TABLE III.—Continued.

Test number.	Variety.	Color of grain.	F—Flint. D—Dent.	Recived from—	Number of ears.	Germinated, per cent.
1625	Leaming	Y	D	J. B. Conn, Hackney	1	100
1626	——	Y	D		4	100
1627	——	Y	D		2	100
1628	Leaming	Y	D	James Riley, Thornton, Ind	3	83.3
1629	Pride of the North	Y	D	same	3	93.3
1630	Riley's Favorite	Y	D	same	4	90
1631	Munn's	Y	D	same	3	96.6
1632	Boone Co. White	W	D	same	3	40
1633	Golden Yellow	Y	D	same	3	3.3
1634	White Dent, 1	W	D	Seth R. Hanchett, Twinsburgh	1	100
1635	" 2	W	D	same	1	100
1636	" 3	W	D	same	1	90
1637	" 4	W	D	same	1	30
1638	Illinois Premium Dent	Y	D	J. C. Vaughan, Chicago, Ill	2	75
1639	Cranberry	W	D	same	2	85
1640	Smith's Improved Yellow	Y	D	Nathan Smith, West Baltimore	4	90
1641	Thompson	Y	D	Lafayette Thompson, Raymonds	3	100
1642	McCoy	S	D	T. G. Webb, Attica, Ind	3	76.6
1643	——	Y	D	M. H. McCoy, Van Wert		100
1644	——	Y	D	G. Tozer, Strasburgh	4	100
1645	Leaming	Y	D	N. H. Tillman, Arcanum	3	60
1646	"	Y	D	John K. Bradfute, Clifton	4	100
1647	——	Y	D	Lewis Legg, Clintonville	4	97.5
1648	Perfection	Y	D	A. Woodling & Sons, Beach City	3	86.6

1649	Pride of the North	Y	D	P. Zigler, Strasburgh	4	97.5
1650	Horse Tooth	W	D	A. H. Lindsay, Portsmouth, Va	3	96.6
1651	——	Y	D	W. J. Mathie, Greentown	2	100
1652	Clarage	Y	D	A. W. Livingston's Sons, Columbus	3	96.6
1653	Early Dawn	W	D	same	3	90
1654	Champion White Beard	W	D	same	3	100
1655	Beard's White Pearl	W	D	same	3	100
1656	Leaming	Y	D	same	3	96.6
1657	Pride of the North	Y	D	same	4	100
1658	Bloody Butcher	R	D	R. G. Crist, New Market, Ind	4	100
1659	Farmer's Favorite	Y	D	same	4	100
1660	Burpee's Golden Beauty	Y	D	same	1	100
1661	——	W	D	F. M. Watkins, Collett, Ind	3	93.3
1662	Calico	S	D	E. C. Smith, Marengo, Ill	4	97.5
1663	——	S	D	A. E. Smith, "	4	100
1664	Hiawassee	W	D	W. M. Woodworth, Irwin	4	32.5
1665	Blood Butcher	R	D	Wm. Moore, New Vienna	3	100
1666	Golden Beauty	Y	D	E. R. Walker, Norwich	2	100
1827	——	W	D	G. F. Parrett, Greenfield	4	97.5
1828	Dutton	Y	F	Emory A. Prior, Cuyahoga Falls	4	92.5
1829	Longfellow	Y	F	same	4	80
1830	White Cap	W	D	same	4	100
1831	Small Dent	Y	D	same	4	100
1832	——	W	D	same	4	77.5
1833	Golden Beauty	Y	D	same	4	30
1834	Heckman	Y	D	S. E. Minnick, Potsdam	2	100
1835	"	Y	D	same	2	85
1836	Dodridge	Y	D	J. M. Allen, Washington C. H	4	92.5
1837	Clarage	Y	D	same	4	92.5
1838	"	Y	D	same	3	96.7
1839	Bounds	Y	D	same	3	70
1840	——	R	D	same	4	100
2283	Leaming	Y	D	Slater Brown, Barton	......	66
2285	Gloria Solis	Y	D	V. H. Hallock, Son & Thorpe, Queens, N. Y	......	22

SWEET CORN.

The vitality tests of sweet or sugar corn used in the field experiments are exhibited in Table IV. With few exceptions the corn germinated well. Sweet corn does not, as a rule, germinate so quickly as field corn, and requires more moisture in germinating.

Sweet corn is less liable to injury from early or extreme cold than field corn, because; first, it ripens earlier in the season, and has a longer time to dry before cold weather sets in; and, second, because it is usually left to ripen more thoroughly before cutting, and dries more on the stalk before husking and cribbing.

The average for all the tests of sweet corn was 80.9 per cent of germinated seeds. There was one variety—Garden Queen (No. 1807)—that failed entirely to sprout. Ninety per cent. and upwards of the seed germinated in a little over 50 per cent. of the tests; and 80 per cent. of the tests gave a germination of over 75 per cent.

SEED TESTS.—TABLE IV.—VARIETIES OF SWEET CORN USED IN EXPERIMENT WORK.

Test number.	Variety.	Received from—	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	No. of seeds in one quart.	No. of seed sprouted in one quart.
1792	Early Evergreen	A. W. Livingston's Sons, Columbus, O	23	4	94	3,492	3,282
1793	Stowell's Evergreen	same	23	3	92	3,334	3,067
1794	Red Cob Evergreen	same	23	3	100	2,561	2,561
1795	Rose's Improved Evergreen	Isaac F. Tillinghast, La Plume, Pa	26	3	82	3,329	2,730
1796	Cory	James J. H. Gregory, Marblehead, Mass	23	3	88	2,766	2,433
1797	"	C. E. Allen, Brattleboro, Vt	23	3	96	2,766	2,655
1798	Early Montana	George H. Colvin, Dalton, Pa	23	3	98	4,098	4,016
1799	Ne Plus Ultra	Johnson & Stokes, Philadelphia, Pa	23	3	78	6,044	4,714
1800	Early Tom Thumb	Peter Henderson & Co., New York, N. Y	23	3	92	3,790	3,487
1801	White Marblehead	Jas. J. H. Gregory, Marblehead, Mass	23	4	92	2,663	3,450
1802	Marblehead Mammoth	A. W. Livingston's Sons, Columbus, O	....	3	100	3,227	3,227
1803	Mammoth	same	....	4	62	2,766	1,715
1804	Extra Early Orange	O. M. Hovey & Co., Boston, Mass	....	3	90	3,329	2,996
1805	Egyptian	A. W. Livingston's Sons, Columbus, O	....	3	96	3,893	3,737
1806	Squantum	same	....	3	56	4,968	2,782
1807	Garden Queen	Geo. H. Colvin, Dalton, Pa	....	....	0	4,450	0
1808	Black Mexican	A. W. Livingston's Sons, Columbus, O	....	3	26	3,381	879
1809	Potter's Excelsior	Geo. H. Colvin, Dalton, Pa	....	3	84	3,688	3,098
1810	Amber Cream	A. W. Livingston's Sons, Columbus, O	....	5	88	3,790	3,335
1811	Golden	C. E. Allen, Brattleboro, Vt	....	3	58	2,971	1,723
1812	Hickox	Joseph Harris, Rochester, N. Y	....	3	94	3,534	3,322
1813	Early Bonanza	Johnson & Stokes, Philadelphia, Pa	....	5	90	2,920	2,628
1814	Improved Mammoth	Frank Ford & Son, Ravenna, O	....	3	94	3,637	3,419
1815	Ford's Early	same	....	5	94	3,278	3,081
1816	Early Minnesota	Peter Henderson & Co., New York, N. Y	28	3	96	2,971	2,852
1817	Crosby's Early	A. W. Livingston's Sons, Columbus, O	30	3	86	3,944	3,392

SEED TESTS.—TABLE IV.—Continued.

Test number.	Variety.	Received from—	First seed sprouted—hours.	Last seed sprouted—days.	Total seed sprouted—per cent.	No. of seeds in one quart.	No. of seed sprouted in one quart.
1818	New Triumph	Ohio State University, Columbus, O	....	4	11.4	2,305	263
1819	New Pee and Kay	A. W. Livingston's Sons, Columbus, O	25	4	96	3,841	3,687
1820	Early Concord	same	24	3	94	3,227	3,033
1821	" "	Peter Henderson & Co., New York, N. Y	24	3	90	3,073	2,766
1822	Crosby's Early	same	30	3	98	3,893	3,815
1823	Henderson	same	30	3	82	3,329	2,730
1824	Perry's Hybrid	B. L. Bragg & Co., Springfield, Mass	30	3	100	3,124	3,124
1825	Adams' Early	A. W. Livingston's Sons, Columbus, O	30	4	70	2,927	2,044
1826	Adams' Extra Early	same	30	4	70	3,637	2,546
2284	———	E. S. Teagarden, Davenport, Iowa	....	3	84	2,857	2,400
2286	Hickox	A. W. Livingston's Sons	....	3	50	2,964	1,482
2287	Tom Thumb	same	....	3	98	2,752	2,696
2288	Early Minnesota	same	....	3	82	4,022	3,298
1289	Landreth's Sugar	David Landreth & Sons	....	5	80	4,498	3,598

VEGETABLE SEEDS PLANTED AT THE STATION.

The vegetable seeds used in the experiment work in the garden deparment were tested for their vitality. The results are given in Table V.

This table exhibits in the column on the left, as in other tables of seed tests, the number of the test as kept on the Station records. The next column gives the name of the variety of seed; following the variety is the name of the individual or firm from whom the seed was obtained. In the columns to the right are given the per cent. of seed that germinated in each trial, the number of seeds of each variety in one ounce, determined from careful, accurate weighings and countings, and the number of germinated seeds in one ounce of each variety, computed from the total number of seeds in one ounce, and the per cent. that germinated in the trial. The same individual seeds were weighed, counted, and tested for vitality. With a few exceptions, fifty seeds were used in each germination test shown in this table.

The tests of the same variety from different seedsmen are, as a rule, grouped together in successive.tests, for convenience in comparing them, each with the others, and with the same varieties in the field.

With cabbage seeds, the per cent. of seeds from the different packets that germinated reaches from one extreme to the other, as might be expected in so great a number of tests. The least vitality was found in a packet of Henderson's Early Summer, No. 2313, from Samuel Wilson, Mechanicsville, Pa., of which none germinated. Little better than this were two other packets of the same variety; one, No. 2301, from W. Atlee Burpee & Co., of Philadelphia, Pa., and the other, No. 2303, from Benson, Maule & Co., also of Philadelphia, from each of which a germination of only 6 per cent. was obtained. There were two other packets with very low vitality; one of Superior Late Flat Dutch, No. 2166, from W. Atlee Burpee & Co., only 12 per cent. of which sprouted, and another of Henderson's Early Summer, No. 2302, from Francis Brill, Riverhead, N. Y., with 18 per cent. sprouted. On the other hand, the highest degree of vitality was shown in a packet of Premium Flat Dutch, No. 1900, from Johnson & Stokes. of Philadelphia, Pa., and one of Short Stem Drumhead, No. 1917, from Samuel Wilson, 100 per cent. of each having germinated. A germination of 90 per cent. and above was obtained from fifty-two packets, or one third of the tests. In one hundred and fifteen, or nearly 74 per cent. of the tests, there was a germination of over 75 per cent.; and in only twelve packets—less than 8 per cent.—five of which have been noted above, was there a germination of less than 50 per cent. The average for the whole of the one hundred and fifty-six tests was 78.9 per cent. sprouted. (See table V.)

There was a marked difference in the weight of the seeds, the heaviest, No. 1945, weighing nearly three times as much as the lightest, No. 2303. This difference is quite remarkable to be fouud in a single species of plant in which man's endeavor has not been to modify the seed, but his whole effort directed to another part of the plant. Even in the same variety there is a very great difference in the weight. Compare No. 2302 and No. 2303.

There seems to be no relation whatever between the weight of the seed and the vitality, for among the heavy and the light seeds there were about equally good and poor germinations.

The tests of radish seeds were fewer in number, but exhibit nearly as wide a variation in per cent. sprouted. The poorest germination was from a packet of Long Scarlet, (imported seed) No 2026, from David Landreth & Sons, of which only 12 per cent. sprouted. The best result was obtained from a packet of White Spanish, No. 2039, from D. Landreth & Sons, Philadelphia, Pa., which gave 100 per cent. germinated. The second poorest germination was from a packet of White Tipped Turnip, No. 2023, from the last named firm, and the second best from Mammoth Summer, No. 2034, from A. W. Livingston's Sons, Columbus, O., 98 per cent. of which germinated. The average number that sprouted in all the tests was 64.86 per cent.

The difference in the weight of the seeds in different packets is much less than in the cabbage seeds, the lightest, No. 2031, being more than half as heavy as the heaviest, Nos. 2026 and 2047.

The poorest lettuce seed was a packet of Drumhead, No. 2093, from W. Atlee Burpee & Co., Philadelphia, none of which sprouted. Earliest Cutting from D. Landreth & Sons, gave a germination of only 2 per cent., and nearly as poor as this was another packet from the same firm, Bloomsdale Butter, No. 2060, and one also from W. Atlee Burpee & Co , Burpee's Silver Bell, No. 2092, only 4 per cent. of each having germinated. The highest germination was from Yellow Seeded Butter, No. 2061, from W. Atlee Burpee & Co., Bloomsdale Early Summer, No. 2068, Royal Cabbage, No. 2077, and Speckled Dutch Butter, No. 2079, from D Landreth and Sons, and White Seeded Simpson, No. 2071, and Black Seeded Simpson, No. 2072, from A. W. Livingston's Sons, every seed in each of these six packets having sprouted.

The tests of onion seed were very unsatisfactory. The tester, when adjusted so as to procure the best results from many other seeds, is not adapted to test onion seed with satisfaction.

Nearly all of the turnip seed was procured from one seed firm, and as there is a high per cent. of germination without great variation, and a good deal of uniformity in the weight of the seed, further comparison than is shown plainly in the table is not necessary.

The general low germination of the cauliflower seed is noticeable. Usually the per cent. that germinated is about the same as that of cabbage; but the tests fall quite a way below the tests of cabbage seed this year. The cause for this has not been ascertained. The weight of the seeds from the different packets is quite uniform, although one sample, No. 2192, is much lighter than the average.

The beans germinated very well with very few exceptions, there being but three tests in which less than fifty per cent. sprouted. The poorest sample was Ivory Pod Wax, No. 2244, from W. Atlee Burpee & Co., only ten per cent. germinating. The two others with low vitality were Brown Speckled Valentine, No. 2224, from D. Landreth & Sons, and New Golden Wax, No. 2246, from Benson, Maule & Co. In eight samples,—almost 20 per cent. of the tests—every bean in each test sprouted.

There are several different species of bean represented in the table, and to this is mostly due the difference in weight, although there is quite a variation in the different varieties of the same species, and some in the same variety. It will be observed that of the beans, and also of the peas, the two columns in the right give the number of seeds in a quart, instead of an ounce as in the first part of the table..

There were four samples of peas of which less than 50 per cent. sprouted, and three of these were very poor. The poorest was Yorkshire Hero, No. 2281, from D. Landreth & Sons; the next, another sample of the same variety, No. 2279, from A. W. Livingston's Sons, which germinated 2 per cent., and the third Carter's Little Wonder, No. 2280, from D. M. Ferry & Co., that gave eight per cent. of sprouted seeds. The highest per cent. of germinated seeds was produced by First and Best, No. 2257, from Hiram Sibley & Co., being 98 per cent.

SEED TESTS.—TABLE V.—VARIETIES OF VEGETABLES USED IN EXPERIMENT WORK.

Test number.	Variety.	From—	Germinated—per per cent.	No. of seeds in one ounce.	No. of seeds in one ounce that germinated.
	CABBAGE.				
1841	Early Etampes	D. M. Ferry & Co., Detroit, Mich	88	8,278	6,405
1842	" "	Jas. J. H. Gregory, Marblehead, Mass	94	9,808	9,220
1843	" "	Benson, Maule & Co., Philadelphia, Pa	70	8,278	5,795
1844	" "	Francis Brill, Riverhead, N. Y	62	7.654	7,445
1845*	Early Drumhead St. John's Day	Vilmorin, Andrieux et Cie	90	7,711	6,940
1846	" "	Francis Brill	96	9,242	8,872
1847	Early Bleichfield Giant	D. Landreth & Sons, Philadelphia, Pa	90	8,732	7,859
1848	" "	Isaac F. Tillinghast, La Plume, Pa	88 9	5,783	5,141
1849	" "	same	86	6,804	5,851
1850	" "	Benson, Maule & Co	90	6,350	5,715
1851	Early Tourlaville	same	92	7,031	6,469
1852	Early Deep Head	Jas. J. H. Gregory	70	7,484	5,239
1853	Early Wyman	same	86	8,732	7,510
1854	Early Flat Dutch	Benson, Maule & Co	94	5,897	4,543
1855	" "	Peter Henderson & Co., New York	78	7,598	5,926
1856	" "	D. M. Ferry & Co	92	6,747	6,207
1857	" "	David Landreth & Sons	80	8,959	7,167
1858	Newark Early Flat Dutch	Francis Brill	86	6,861	5,900
1859	" "	D. M. Ferry & Co	86	6,407	5,510
1860	" "	Jas. J. H. Gregory	94	6,577	6,182
1861	" "	Jos. Harris, Rochester, N. Y	82	7,484	6,137
1862	Fottler's Improved Brunswick	Isaac F. Tillinghast	96	9,355	8,981
1863	Johnson & Stokes' Earliest	Johnson & Stokes, Philadelphia, Pa	90	6,634	5,971
1864	Landreth's Earliest	David Landreth & Sons	90	10,093	9,084
1865	" "	same	90	8,505	7,654

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* Seed two years old.

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—	Germinated—per cent.	No. of seeds in one ounce.	No. of seeds in one ounce that germinated.
	CABBAGE.—Continued.				
1866	Landreth's Large York	David Landreth & Sons	86	7,484	6,436
1867	Large York	James Vick, Rochester, N. Y.	50	7,031	3,515
1868	Low's Peerless	A. W. Livingston's Sons, Columbus, O	90	7,825	7,042
1869	Low's Early Peerless	Jas. J. H. Gregory	90	7,598	6,838
1870	Little Pixie	James Vick	58	6,691	3,881
1871	Henderson's Premier	Peter Henderson & Co	92	8,618	7,929
1872	Early Winningstadt	A. W. Livingston's Sons	98	7,031	6,890
1873	" "	D. Landreth & Sons	58	11,340	5,577
1874	" "	Jos. Harris	94	10,319	9,700
1875	" "	Sam'l Wilson, Mechanicsville, Pa	98	8,732	8,557
1876	Wheeler's Imperial	James Vick	70	7,371	5,160
1877	The Warren	James J. H. Gregory	92	6,350	5,842
1889	Prize Flat Dutch	Benson, Maule & Co	88	8,108	7,135
1890	Pale Green Flat Dutch	Francis Brill	80	10,432	8,346
1891	Excelsior Flat Dutch	same	86	7,428	6,388
1892	Premium Flat Dutch	same	92	7,541	6,938
1893	Bristol Flat Dutch	same	80	9,072	7,258
1894	Superior Late Flat Dutch	W. Atlee Burpee & Co., Philadelphia, Pa	66	7,825	5,758
1895	Excelsior Late Flat Dutch	Isaac F. Tillinghast	90	10,376	9,338
1896	Premium Flat Dutch	James J. H. Gregory	96	6,634	6,369
1897	Premium Late Flat Dutch	Samuel Wilson	52	9,299	4,835
1898	Late Flat Dutch	Peter Henderson & Co	84	7,144	6,001
1899	Premium Flat Dutch	same	82	7,541	6,184
1900	" "	Johnson & Stokes	100	7,598	7,598
1901	" "	A. W. Livingston's Sons	50	7,484	3,742
1902	" "	Hiram Sibley & Co., Rochester, N. Y	84	7,825	6,573

1903	Large Late Flat Dutch	same	86	7,484	6,436
1904	Premium Flat Dutch	Jos. Harris	88	8,959	7,884
1905	Excelsior Flat Dutch	same	80	7,938	6,350
1906	" "	James Vick	76	8,959	6,869
1907	" "	same	68	7,825	5,321
1908	Premium Flat Dutch	same	94	8,278	7,781
1909	" "	Isaac F. Tillinghast	96	7,258	6,968
1910	Excelsior Flat Dutch	same	96	6,691	6,423
1911	Premium Flat Dutch	same	76	8,051	6,119
1912	" "	D. M. Ferry & Co.	82	9,412	7,718
1913	Bloomsdale Flat Dutch	David Landreth & Sons	86	8,278	7,119
1914	Improved Brunswick	Benson, Maule & Co.	98	10,206	10,002
1815	" "	Isaac F. Tillinghast	96	6,464	6,205
1816	" "	Francis Brill	82	7,484	6,137
1817	Short Stem Drumhead	Samuel Wilson	100	8,392	8,392
1918	Late American Drumhead	Isaac F. Tillinghast	82	7,484	6,137
1919	" "	same	90	9,072	8,165
1920	Royal German Drumhead	Johnson & Stokes	92	7,144	6,572
1921	Premium Large Drumhead	D. M. Ferry & Co	88	8,392	7,385
1922	Short Stem Drumhead	W. Atlee, Burpee & Co	94	8,392	7,888
1923	Bridgeport Late Drumhead	A. W. Livingston's Sons	90	7,258	6,532
1924	Fottler's Drumhead	Jos. Harris	68	8,165	5,552
1925	Improved Late Drumhead	Francis Brill	78	5 443	4,246
1926	Stone Mason Drumhead	same	74	8,959	6,630
1927	Silver Leaf Drumhead	same	88	9,185	8,083
1928	Louisville Drumhead	same	76	7,031	5,344
1929	Short Stem Drumhead	same	82	6,067	4,975
1930	Large Red Dutch	same	76	6,634	5,042
1931	Marblehead Mammoth Drumhead	Peter Henderson & Co	78	5,897	4,600
1932	" "	D. M. Ferry & Co.	70	9,412	6,300
1933	" "	Jas. J. H. Gregory	80	7,825	6,260
1934	" "	Benson Maule & Co.	70	8,392	5,874
1935	Green Glazed	Peter Henderson & Co	72	7,428	5,348
1936	Late Mountain	David Landreth & Sons	82	8,732	7,160
1937	Pomeranian	Jas. Vick	68	7,314	4,974
1938	Golden Savoy	Johnson & Stokes	94	6,577	6,182
1939	Early Dwarf Ulm Savoy	D. M. Ferry & Co	96	9,412	9,036
1940	Improved American Savoy	same	86	12,928	11,118
1941	Perfection Drumhead Savoy	Francis Brill	96	7,258	6,968
194-	Drumhead Savoy	A. W. Livingston's Sons	34	8,505	2,892

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—	Germinated—per cent.	Number of seeds in one ounce.	Number seeds in one ounce that germinated.
	CABBAGE.—Continued.				
1943	Burpee's Surehead	W. Atlee Burpee & Co	92	7,938	7,303
1944	Johnson & Stokes' Surehead	Johnson & Stokes	82	7,484	6,137
1945	Maule's Surehead	Benson, Maule & Co	84	4,990	4,192
1946	Burpee's Surehead	Francis Brill	80	6,804	5,443
1947	Surehead	Samuel Wilson	88	7,144	6,287
2158	Large Jersey Wakefield	David Landreth & Sons	76	7,825	5.947
2159	Excelsior Flat Dutch	Jos. Harris	82	7,371	6.044
2160	" "	same	58	8,845	5,130
2161	Premium Flat Dutch	same	64	8,845	5,661
2162	Large Late Mountain	David Landreth & Sons	70	8,051	5,636
2163	Burpee's Surehead	W. Atlee Burpee & Co	86	7,598	6,534
2164	Short Stem Drumhead	same	94	7,144	6,715
2165	Premium Late Flat Dutch	Hiram Sibley & Co	96	6,917	6,640
2166	Superior Late Flat Dutch	W. Atlee Burpee & Co	12	6,917	830
2167	Premium Flat Dutch	James Vick	94	7,598	7,142
2168	Newark Flat Dutch	Jos. Harris	86	6,350	5,461
2169	Large York	David Landreth & Sons	80	7,598	6,078
2170	Early Summer	Hiram Sibley & Co	98	7,484	7,336
2171	Early Bleichfield Giant	D. Landreth & Sons	88	7,484	6,586
2172	Early Dwarf Flat Dutch	same	36	6.917	2,490
2173	Early Jersey Wakefield	Hiram Sibley & Co	48	7,711	3,701
2174	Landreth's Earliest	David Landreth & Sons	88	9,979	8,781
2213	Selected Flat Dutch	Peter Henderson & Co	80	7,484	5,687
2292	" "	same	90	7,598	6,838
2293	" "	same	90	7,598	6,838

2301	Henderson's Early Summer	W. Atlee Burpee & Co	6	8,278	497
2302	" "	Francis Brill	18	6,010	1,082
2303	" "	Benson, Maule & Co.	6	13,041	782
2304	" "	D. M. Ferry & Co	78	6,520	5,086
2305	" "	Jas. J. H. Gregory	70	7,428	5,200
2306	" "	Jos. Harris	86	7,655	6,582
2307	" "	Peter Henderson & Co	80	7,654	6,123
2308	" "	Johnson & Stokes	32	6,691	2,141
2309	" "	A. W. Livingston's Sons	94	7,258	6,823
2310	" "	David Landreth & Sons	86	8,278	7,119
2311	" "	Isaac F. Tillinghast	92	7,484	6,885
2312	" "	James Vick	80	8,618	5,454
2313	" "	Samuel Wilson	0	8,902	0
2314	Early Jersey Wakefield	Francis Brill	45	5,443	2,449
2315	Large Early Jersey Wakefield	same	68	6,180	4,202
2316	Early Jersey Wakefield	Benson, Maule & Co.	82	6,294	5,161
2317	" "	W. Atlee, Burpee & Co	58	7,562	4,386
2318	" "	D. M. Ferry & Co	88	5,892	5,185
2319	" "	Jas. J. H. Gregory	76	6,407	4,896
2320	" "	Jos. Harris	72	6,917	4,980
2321	" "	Peter Henderson & Co	74	6,407	4,741
2322	" "	Johnson & Stokes	88	6,861	6.038
2323	" "	A. W. Livingston's Sons	98	7,484	7,334
2324	" "	D. Landreth & Sons	76	7,428	5,645
2325	" "	same	56	8,392	4,700
2326	" "	Isaac F. Tillinghast	82	7,938	6,509
2327	" "	James Vick	86	7,938	6,827
2328	" "	Sam'l Wilson	58	7,995	4,637
2329	Berkshire Beauty	Benson, Maule & Co	92	8,221	7,563
2330	" "	Isaac F. Tillinghast	94	8,618	8,101
2331	Early Drumhead Flat Dutch	David Landreth & Sons	42	6,294	2,643
2332	Early Market	same	62	7,258	4,500
2333	Advance	W. Atlee Burpee & Co.	88	8,051	7,085
2334	New, No. 1	same	90	8,675	7,807
2335	Burpee's No. 2	same	90	7,144	6,430
2336	Cannon Ball	Francis Brill	48	8,959	4,300
2337	Newark Early Flat Dutch	Benson, Maule & Co.	82	10,546	8,662
2338	Early Dwarf York	James Vick	86	7,314	6,290

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—.	Germinated—per cent.	Number of seed in ounce.	Number seed in one ounce that germinated.
	CABBAGE—Continued.				
2339*	Very Early Etampes	Vilmorin, Andrieux et Cie	96	8,108	7,784
2340	" "	Johnson & Stokes	86	6,804	5,851
	RADISH.				
2018	Round Scarlet	A. W. Livingston's Sons	60	2,948	1,769
2019	Early Scarlet Erfurt	David Landreth & Sons	34	3,459	1,176
2020	Early Scarlet Turnip	A. W. Livingston's Sons	38	3,572	1,357
2021	" "	David Landreth & Sons	32	3,005	962
2022	White-tipped Turnip	same	20	2,835	567
2023	" "	A. W. Livingston's Sons	80	3,515	2,812
2024	Early Long Scarlet	same	50	2,344	1,172
2025	" "	David Landreth & Sons	40	2,306	922
2026	Long Scarlet	same	12	2,268	272
2027	Strap Long Scarlet	same	74	3,326	2,461
2028	Early Scarlet Prussian Globe	same	44	2,835	1,247
2029	Early White Turnip	A. W. Livingston's Sons	44	3,629	1,597
2030	Wood's Early Frame	same	34	2,533	861
2031	Early White Turnip	David Landreth & Sons	36	4,007	1,443
2032	Gray Summer Turnip	A. W. Livingston's Sons	66	2,986	1,971
2033	Yellow Summer	same	60	3,213	1,928
2034	Mammoth Summer	same	98	2,986	2,926
2035	Round Black Spanish	same	68	2,835	1,928
2036	Long "		70	2,835	1,984

*Seed two years old.

2037	Scarlet China Winter	David Landreth & Sons	82	2,873	2,356
2038	Chinese Rose Winter	A. W. Livingston's Sons	74	2,986	2,210
2039	White Spanish	David Landreth & Sons	100	2,835	2,835
2040	California Mammoth	A. W. Livingston's Sons	54	2,948	1,592
2041	Dayton White	same	92	2,835	2,608
2042	“ “	same	94	3,402	3,198
2043	Long White Naples	same	70	2,835	1,984
2044	French Breakfast	same	96	3,440	3,302
2045	Golden Globe	David Landreth & Sons	82	3,478	2,853
2046	“ “	A. W. Livingston's Sons	68	3,591	2,448
2047	Garnet Turnip	David Landreth & Sons	86	2,268	1,950
2048	White Lady Finger	same	82	3,100	2,542
2049	Olive Rose	A. W. Livingston's Sons	72	3,704	2,667
2050	Grant Stuttgart	same	74	3,100	2,294
2051	Improved Chartiers	same	88	2,684	2,362
2052	“ “	same	96	2,570	2,467

Lettuce.

2053	New Perpetual	W. Atlee Burpee & Co	14	16,330	2,284
2054	Heat-resisting Cos	David Landreth & Sons	14	22,268	3,118
2055	“ “	W. Atlee Rurpee & Co.	94	25,628	24,090
2059	Red Bessen	Jas J. H. Gregory	86	32,659	28,087
2060	Bloomsdale Butter	David Landreth & Sons	4	32,659	1,306
2061	Yellow-seeded Butter	W. Atlee Burpee & Co.	100	22,680	22,680
2065	Improved White Tennis Ball	Jas. J. H. Gregory	90	30,391	27,352
2067	Black Tennis Ball	same	34	20,412	6,940
2068	Bloomsdale Early Summer	David Landreth & Sons	100	22,226	22,226
2069	Bloomsdale Reliable	same	92	28,123	25,873
2071	White-seeded Simpson	A. W. Livingston's Sons	100	17,464	17,464
2072	Black-seeded “	same	100	17,917	17,917
2073	Early Curled “	W. Atlee Burpee & Co.	90	18,824	16,942
2077	Royal Cabbage	David Landreth & Sons	100	23,814	23,814
2078	Philadelphia Early White Cabbage	W. Atlee Burpee & Co.	94	24,494	23,024
2079	Speckled Dutch Butter.	D. Landreth & Sons	100	20,866	20,866
2080	Salamander	A. W. Livingston's Sons	66	24,494	16,166
2082	Landreth's Forcing	D. Landreth & Sons	58	25,855	14,996
2083	Stonehead Golden Yellow	W. Atlee Burpee & Co.	70	22,494	15,746
2085	Sugar Loaf	Jas. J. H. Gregory	8	19,278	1,532
2087	American Head	D. Landreth & Sons	98	18,144	17,781

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—.	Germinated—per cent.	Number of seed ounce.	Number seed in in ounce that germinated.
	RADISH—Continued.				
2089	Earliest Cutting	D. Landreth & Sons	2	29,711	594
2090	Burpee's Golden Head	W. Atlee Burpee & Co.	84	23,587	19,813
2091	Hanson	Jas. J. H. Gregory	18	19,052	3,429
2092	Burpee's Silver Ball	W. Atlee Burpee & Co.	4	26 536	1,061
2093	Drumhead	same	0	21,319	0
2094	The Deacon	Jos. Harris	12	28,350	3,402
2341	Salamander	A. W. Livingston's Sons	92	22,962	21,125
	ONION.				
2096	Early Red	James Vick	4	7,258	290
2097	Large Red Wethersfield	D. M. Ferry & Co	10	7,938	794
2098	“ “	same	16	7,938	1,270
2099	“ “	Jas. J. H. Gregory	20	6,804	1,361
2100	“ “	James Vick	6	6,917	415
2101	Extra Early Red	David Landaeth & Sons	4	6,350	254
2102	Early Bermuda	Jas. J. H. Gregory	2	7,144	143
2103	Bermuda White	David Landreth & Sons	10	9,072	907
2104	White Silver Skin	A. W. Livingston's Sons	18	9,412	1,694
2105	“ “	same	16	7,938	1,270
2106	“ “	Peter Henderson & Co	18	7,031	1,266
2107	Mammoth Silver King	A. W. Livingston's Sons	44	7,938	3,493
2108	“ “	Isaac F. Tillinghast	32	7,371	2,359
2109	Silver King	Bensor, Maule & Co.	18	8,392	1,511

2110	Red Wethersfield	——	52	7,258	3,774
2111	" "	W. Atlee Burpee & Co.	6	6,804	408
2112	New Queen	A. W. Livingston's Sons	40	9,299	3,720
2113	Marzajola	James Vick	24	9,412	2,259
2114	Landreth's Golden	D. Landreth & Sons	68	8,278	5,629
2115	Early Large Red	Jos. Harris	28	7,258	2,032
2116	Mammoth Pompeii	Isaac F. Tillinghast	8	8,051	644
2117	Giant Rocca	A. W. Livingston's Sons	38	8,051	3,059
2118	Vesuvius	Isaac F. Tillinghast	58	7,711	4,472
2119	Stasburgh	Peter Henderson & Co	12	7,711	925
2120	Large Yellow Dutch	A. W. Livingston's Sons	40	7,938	3,175
2121	Danvers Yellow	David Landreth & Sons	6	10,093	606
2122	" "	J. L. Green	52	7,144	3,715
2123	" "	David Landreth & Sons	26	7,711	2,005
2124	" "	I. E. Jones, Clintonville	86	8,505	7,314
2125	" "	A. W. Livingston's Sons	48	7,938	3,810
2126	" "	D. Landreth & Sons	4	7,598	304
2127	" "	Jos. Harris	44	9,979	4,091
2128	" "	Sam'l Wilson	0	8,845	0
2129	" "	Benson, Maule & Co.	0	7,711	0
2130	" "	Hirman Sibley & Co	6	9,526	572
2131	" "	Johnson & Stokes	46	8,845	4,069
2132	" "	D. M. Ferry & Co	42	9,072	3,810
2133	Danvers Extra Yellow Globe	same	42	7,938	3,334
2134	Danvers Yellow Globe	W. Atlee Burpee & Co	42	8,845	3,715
2135	" "	James Vick	24	7,031	1,687
2136	" "	Peter Henderson & Co	26	7,938	2,064
2137	Danvers Extra Yellow Globe	Jas. J. H. Gregory	38	7,598	2,887
2138	Danvers Thick Yellow	W. W. Rawson	56	8,732	4,890
2139	Southport Yellow Globe	Peter Henderson & Co	36	8,051	2,898
2140	New White Globe	A. W. Livingston's Sons	14	7,031	984
2141	Red Globe	same	54	5,670	3,062
2142	White Globe		4	7,031	281
2143	Southport White Globe	Peter Henderson & Co	18	6,804	1,225
2144	Danvers Yellow Globe	A. W. Livingston's Sons	50	7,825	3,912
2145	" "	Hirman Sibley & Co	12	8,618	1,034

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—	Germinated—per cent.	Number of seed in one ounce.	Number seed in one ounce that germinated.
	TURNIP.				
2146	Early Flat Dutch Strap Leaved		40	17,464	6,986
2147	Cowhorn	David Landreth & Sons	96	16,556	15,894
2148	Amber Globe Strap Leaved	same	98	17,690	17,336
2149	Yellow Aberdeen	same	88	12,928	11,377
2150	Yellow Stone	same	80	15,196	12,157
2151	Southern Snow White Globe	same	100	20,185	20,185
2152	Early Red Top Globe	same	100	13,381	13,381
2153	Early Flat Red Strap Leaved	same	98	14,742	14,447
2154	Early Bloomsdale Red Top	same	56	10,660	5,970
2155	Extra Early Purple Top Munich	Peter Henderson & Co	98	15,422	15,114
2156	———————	L. Reeve, Clerbrook, O	100	19,505	19,505
2157	Red Top Strap Leaved	Peter Henderson & Co	98	21,092	20,670
	CAULIFLOWER.				
2175	Early Snowball	Hiram Sibley & Co	34	8,051	2,737
2176	"	A. W. Livingston's Sons	70	6,350	4,445
2177	"	W. Atlee Burpee & Co	40	6,804	2,722
2178	"	Joseph Harris	68	8,392	5,707
2179	"	same	82	8,392	6,881
2180	"	D. M. Ferry & Co	72.2	8,051	5,813
2181	"	Peter Henderson & Co	54	6,804	3,674
2182	"	Benson, Maule & Co	40	7,938	3,175
2183	Extra Early, (No. 1)	Francis Brill	26	7,598	1,975
2184	" (No. 2)	same	16	8,732	1,397
2185	" (No. 3)	same	60	8,505	5,103

2186	Early Erfurt	A. W. Livingston's Sons	22	7,711	1,696
2187	Extra Early Dwarf Erfurt	D. M. Ferry & Co	82	7,371	6,044
2188	" "	W. Atlee Burpee & Co	38	9,072	3,447
2189	Early Dwarf Erfurt	James Vick	54	6,691	3,613
2190	" "	Hiram Sibley & Co	36	9,185	3,307
2191	Dwarf Small Leaved	James Vick	52	6,577	3,420
2192	Half Early Paris	A. W. Livingston's Sons	30	10,319	3,096
2193	Walcheron	James Vick	70	8,392	5,874
2194	Asiatic	Joseph Harris	55.6	8,505	4,729
	PEPPER.				
2195	Bell or Bull Nose	A. W. Livingston's Sons	36	3,969	1,429
2196	Golden Dawn	same	36	4,593	1,653
2197	Orange Mammoth	same	44	4,479	1,971
2198	Large Sweet Mountain	same	8	7,087	567
2199	Ruby King	same	72	3,912	2,817
2200	Mammoth Grossum	same	50	3,356	1,928
	SALSIFY.				
2201	Scorzonera	David Landreth & Sons	0	2,838	0
2202	Common		56	2,778	1,556
2203	"	A. W. Livingston's Sons	82	2,251	1,846
2291	"	same	62.2	5,330	3,315
	PARSNIP.				
2204	Hollow Crown	A. W. Livingston's Sons	10	5,557	556
2290	" "	same	27.1	5,443	1,475
	MUSTARD.				
2205	Large Leaved	David Landreth & Sons	42	12,247	5,144
	TOMATO.				
1200	Acme	Ohio State University	87	....	....
2206	"	A. W. Livingston's Sons	96	8,959	8,601

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—	Germinated—per cent.	Number of seed in one ounce.	Number seed in one ounce that germinated.
	LEEK.				
2207	Carantan	David Landreth & Sons	4	9,752	390
	CRESS.				
2208	Fine Curled	James Vick	48	14,855	7,130
2209	Plain Leaved	same	48	12,928	6,205
	EGG PLANT.				
2210	N. Y. Purple	A. W. Livingston's Sons	8	7,484	599
	RUTA BAGA.				
2211	Bloomsdale Swede	David Landreth & Sons	10	8,845	884
2212	Champion Swede (imported)	same	14	8,278	1,159
	OKRA.				
2214	White Pod	David Landreth & Sons	90	482	434
	MELON—Citron.				
2215	Acme	David Landreth & Sons	76	1,134	862

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—	Germinated—per cent.	Number of seeds in quart.	Number seeds in one quart that germinated.
	Bean.				
2216	Champion Bush	W. W. Rawson & Co., Boston, Mass	100	1,200	1,200
2217	" "	A. W. Livingston's Sons	100	1,200	1,200
2218	Challenger Lima	W. Atlee Burpee & Co	75	870	660
2219	Dreer's Improved Lima	Peter Henderson & Co	52	960	510
2220	King of the Garden Lima	Frank S. Platt, New Haven, Conn	88	630	540
2221	Extra Early Lima	D. M. Ferry & Co	100	960	960
2222	Extra Early Red Valentine	David Landreth & Sons	100	2,130	2,130
2223	White Valentine	same	90	2,280	2,240
2224	Brown Speckled Valentine	same	42	2,880	1,200
2225	Red Valentine	Peter Henderson & Co	88	2,370	2,100
2226	Red Valentine	same	98	2,760	2,700
2227	First in Market	David Landreth & Sons	80	2,220	1,770
2228	Early Feejee	Peter Henderson & Co	100	1,950	1,950
2229	White Crease Back	D. M. Ferry & Co	88	3,780	3,330
2230	Goddard Bush	W. W. Rawson & Co.	100	930	930
2231	Oval Red Speckled Cornfield	David Landreth & Sons	96	3,360	3,240
2232	Southern Prolific Pole	same	96	5,880	5,640
2233	Cream Seeded Cut Shorts	same	96	2,280	2,190
2234	Wonder of France	Peter Henderson & Co	82	2,850	2,340
2235	Dwarf Mont D'Or	same	98	3,960	3,870
2236	Cleveland's Improved Valentine	A. W. Livingston's Sons	90	2,310	2,070
2237	Boston Market Favorite	same	96.7	960	930
2238	(A new Bean)	J. A. Everitt, Watsontown, Pa	86	1,800	1,560
2239	Golden Refugee	Benson, Maule & Co	82	3,600	2,940
2240	Refugee	Peter Henderson & Co	78	2,730	2,130

SEED TESTS.—TABLE V.—Continued.

Test number.	Variety.	From—	Germinated—per cent.	Number of seeds in one quart.	Number of seeds in one quart that germinated.
	BEAN.—Continued.				
2241	Refugee	R. G. Crist, Newmarket, Ind	88.5	2,340	2,070
2242	New Golden Wax	Benson, Maule & Co	62	2,160	1,350
2243	Golden Wax	D. M. Ferry & Co	77.5	2,160	1,680
2244	Ivory Pod Wax	W. Atlee Burpee & Co	10	3,390	339
2245	Rhode Island Cream	D. M. Ferry & Co	100	1,920	1,920
2246	New Golden Wax	Benson, Maule & Co	48	2,100	1,020
2247	Landreth's Violet	David Landreth & Sons	54	1,860	990
2248	Improved Prolific Tree	Benson, Maule & Co	66	3,900	2,580
2249	Improved Prolific Tree	E S. Teagarden, Davenport, Iowa	58	4,260	2,460
2250	Landreth's Scarlet	David Landreth & Sons	85	1,980	1,680
2251	Green Gem	Benson, Maule & Co	57.1	3,390	1,950
2252	Green Gem	R. G. Crist	90	2,820	2,550
2253	Kentucky Wonder	D. M. Ferry & Co	95.6	2,280	2,190
2254	Colorado Dwarf Bush	Samuel Wilson	88	3.150	2,760
2255	Flageolet (New variety)	Rural New Yorker	100	2,940	2,940
2256	Green Gem	W. Atlee Burpee & Co	97·1	3,120	3,030
	PEA.				
2257	First and Best	Hiram Sibley & Co	98	3,960	3,870
2258	Philadelphia Extra Early	same	72	4,140	2,970
2259	Philadelphia Extra Early	Johnson & Stokes	61	4,200	2,550
2260	First and Best	———	66	3,900	2,580
2261	First and Best	D. M. Ferry & Co	82	3,750	3,060
2262	First and Best	W. W. Rawson & Co	86	4,820	3,720
2263	Philadelphia Extra Early	W. Atlee Burpee & Co	72	4,140	2,970

2264	Benson, Maule & Co.'s Extra Early	Benson, Maule & Co	74	4,020	2,970
2265	Burpee's Extra Early	W. Atlee Burpee & Co	68	5,100	3,480
2266	Vick's Extra Early	James Vick	92	3,240	2,971
2267	Extra Early Reliance	J. A. Everitt	54	3,630	1,950
2268	Extra Early Tom Thumb	D. M. Ferry & Co	60	4,200	2,520
2269	Everitt's Early	J. C. Everitt, Lima, Ind	56	3,900	2,160
2270	Rawson's Seventeenth of June	W. W. Rawson & Co	60	3,810	2,280
2271	Market Garden	Horsford & Pringle, Charlotte, Vt	84	3,900	3,270
2272	Excelsior	C. E. Allen, Brattleboro, Vt	72	3,810	2,730
2273	Early Daniel O'Rouke	W. W. Rawson & Co	78	3,870	3,030
2274	Carter's Premium Gem	Jas. J. H. Gregory	40	3,570	1,440
2275	Maule's Family Gem	Benson, Maule & Co	56	4,140	2,310
2276	Dwarf Gray Sugar	A. W. Livingston's Sons	74	5,670	4,200
2277	Tom Thumb	D. M. Ferry & Co	84	4,380	3,690
2278	Dwarf Champion of England	Jas. J. H. Gregory	82	2,070	1,710
2279	Yorkshire Hero	A. W. Livingston's Sons	2	2,430	60
2280	Carter's Little Wonder	D. M. Ferry & Co	8	2,580	210
2281	Yorkshire Hero	David Landreth & Sons	0	2,520	0
2282	Garden Pride	J. C. Everitt	68	3,990	270

COMMISSION SEEDS.

The results of the tests made in 1884 of the vitality of seeds purchased from commission men, compared with those from prominent seedsmen direct, showed that there was a difference, the former giving the lowest per cent. of germination in nearly every instance. During the spring of 1885 this investigation was continued, and a much larger number of samples tested than the previous year. The results agree pretty generally with those of last year. The commission seeds were purchased from several grocers in Columbus, O., and represent three different seed houses.

Table VI. gives the full list of these tests for 1885, showing the recorded number of the test, the name of each variety and of the seedsman by whom it was put up, the per cent. that germinated, the number of seeds in one ounce and the number of seeds that would sprout from one ounce at the rate of germination in the test.

In the tests of cabbage seed the smallest number of sprouted seeds was from a packet of Improved Early Drumhead, No. 1881, from D. M. Ferry & Co., and another of Early Dwarf Flat Dutch, No. 1883, from Hiram Sibley & Co., 6 per cent. of each having germinated. The highest germination was only 88 per cent., from a packet of Early Dwarf Flat Dutch, No. 1882, from D. M. Ferry & Co. There is not so great a difference between the poorest and the best as in the seeds direct from the seedsmen, but the tests cover only about one-eighth as many samples as the latter. The average for the nineteen tests was 40.74 per cent., only a little more than half that of cabbage seeds direct from seedsmen.

In no instance did 90 per cent. or above germinate, while in those from seedsmen direct one-third of the tests gave germinations this high. In two, or a little more than 11 per cent. of the tests, the germination was higher than 75 per cent. as compared with nearly 74 per cent. of the tests of cabbage seed from seedsmen direct. In more than two-thirds of the tests there were less than 50 per cent. germinated.

The tests of onion seeds were very unsatisfactory. However, better results were obtained from commission seed than from seed direct from the seedsmen. The reason for this is not evident.

In the tests of radish seeds there was a greater difference between the seed from grocers and from seedsmen than was found in the cabbage seeds. The average of the seed from grocers was only 24 per cent. sprouted; but of those from seedsmen nearly 65 per cent. sprouted.

SEED TESTS.—TABLE VI.—COMMISSION SEEDS PURCHASED FROM GROCERS.

Test number.	Variety.	Put up by—	Germinated—per cent.	Number of seeds in one ounce.	Number seeds in one ounce that germinated.
	CABBAGE.				
1878	Henderson's Early Summer	Jerome B. Rice & Co., Cambridge, N. Y	70	7,031	4,922
1879	Early Market	D. M. Ferry & Co., Detroit, Mich.	20	7,938	1,588
1880	Early Drumhead	Hiram Sibley & Co., Rochester, N. Y	28	8,505	2,381
1881	Improved Early Drumhead	D. M. Ferry & Co	6	8,505	510
1882	Early Dwarf Flat Dutch	same	88	7,938	6,985
1883	" "	Hiram Sibley & Co.	6	9,866	592
1884	Early York	same	28	8,335	2,334
1885	"	D. M. Ferry & Co	42	8,959	3,763
1886	Early Winningstadt	same	84	8,505	7,144
1887	" "	Jerome B. Rice & Co.	44	7,959	3,502
1888	" "	Hiram Sibley & Co.	28	7.484	2,096
1948	Large Late Flat Dutch	same	8	7,481	599
1949	" "	D. M. Ferry & Co	74	7,598	5,623
1950	Premium Large Drumhead	same	70	7,484	5,239
1951	" "	same	46	6,917	3,182
1952	Improved American Savoy	same	26	8,165	2,143
1953	Marblehead Mammoth Drumhead	same	22	6,917	1,542
1954	Large Late Drumhead	Hiram Sibley & Co.	16	8.618	1,379
1955	" "	same	68	8,732	5,938
	TOMATO.				
1956	Perfection	Jerome B. Rice & Co.	40	10,886	4,354
1957	"	D. M. Ferry & Co	74	8,732	6,462
1958	Hathaway's Excelsior	Hiram Sibley & Co.	2	8,959	179
1959	" "	D. M. Ferry & Co	12	9,299	1,115

SEED TESTS.—TABLE VI.—Continued.

Test number.	Variety.	Put up by—	Germinated—per cent.	Number of seeds in one ounce.	Number seeds in one ounce that germinated.
	TOMATO.—Continued.				
1960	Early Conqueror	D. M. Ferry & Co	52	9,072	4,717
1961	Red Trophy	Hiram Sibley & Co	70	8,845	6,191
1962	Early Acme	same	72	9,299	6,695
1963	Large Red	D. M. Ferry & Co	36	9,412	3,388
1964	Large Smooth Red	same	90	9,412	8,471
1965	Acme	same	58	9,979	5,788
1966	Trophy	same	50	9,649	4,824
1967	Canada Victor	same	56	10,093	5,652
1968	Paragon	same	78	9,526	7,430
	TURNIP.				
1969	Early Purple Top Strap Leaved	D. M. Ferry & Co	88	18,257	16,066
1970	" "	Hiram Sibley & Co	42	12,928	5,430
1971	Early White Flat Dutch	same	28	13,721	3,842
1972	" "	D. M. Ferry & Co	94	15,763	14,817
1973	Red Top Flat Norfolk	same	52	12,928	6,723
1974	Purple Top Yellow Aberdeen	Jerome B. Rice & Co	2	12,928	259
1975	Yellow Stone	same	88	14,288	12,573
1976	Early Red Top Strap Leaved	same	94	18,257	17,162
	ONION.				
1977	Large Red Wethersfield	Jerome B. Rice & Co	54	8,165	4,409
1978	" "	D. M. Ferry & Co	66	7,825	5,164
1979	" "	same	82	7,825	6,416

1980	" "	Hiram Sibley & Co.	0	7,938	0
1981	Early Red	D. M. Ferry & Co.	34	7,938	2,699
1982	Yellow Danvers	Jerome B. Rice & Co.	50	8,392	4,196
1983	"	Hiram Sibley & Co.	32	8,845	2,830
1984	"	D. M. Ferry & Co.	44	8,959	3,942
1985	White Silver Skin	Hiram Sibley & Co.	18	8,165	1,470
1986	"	D. M. Ferry & Co.	32	8,392	2,685
	CUCUMBER.				
1987	Early Frame	Jerome B. Rice & Co.	70	1,179	825
1988	Early Cluster	same	68	1,021	694
1989	"	D. M. Ferry & Co.	82	975	799
1990	"	Hiram Sibley & Co.	46	1,157	532
1991	Early Frame	same	28	1,043	292
1992	"	D. M. Ferry & Co.	48	1,043	501
	CARROT.				
1993	New Danvers	Jerome B. Rice & Co.	54	12,928	6,981
1994	Early Scarlet Stump Rooted	D. M. Ferry & Co.	54	14,742	7,961
1995	Half Long	Hiram Sibley & Co.	26	13,948	3,626
1996	Improved Long Orange	D. M. Ferry & Co.	26	11,453	2,978
1997	Early Scarlet Horn	same	38	13,608	5,171
	CAULIFLOWER.				
1998	Walcheron	Hiram Sibley & Co.	28	7,371	2,064
1999	Henderson's Early Snowball	Jerome B. Rice & Co.	78	6,691	5,219
2000	Early Erfurt	D. M. Ferry & Co.	50	9,866	4,933
2001	True Erfurt	Hiram Sibley & Co.	20	9,299	1,860
	RADISH.				
2002	Early Long Scarlet	Hiram Sibley & Co.	16	2,013	322
2003	Early Scarlet Turnip	same	0	2,948	0
2004	Chinse Rose Winter	same	0	3,600	0
2005	" "	D. M. Ferry & Co.	92	3,062	2,817
2006	New French Breakfast	Hiram Sibley & Co.	12	3,487	418

SEED TESTS.—TABLE VI.—Continued.

Test number.	Variety.	From—	Germinated—per cent.	Number of seed in ounce.	Number of seed in one ounce that germinated.
	EGG PLANT.				
2007	N. Y. Round Pruple	Hiram Sibley & Co	6	7,253	435
2008	Large Purple	D. M. Ferry & Co	10	7,371	737
	PARSNIP.				
2009	Hollow Crown	D. M. Ferry & Co	32	6,350	2,032
	PEPPER.				
2010	Bull Nose	D. M. Ferry & Co	54	4,196	2,266
2011	"	Hiram Sibley & Co	18	4,763	857
	LETTUCE.				
2012	Simpson's Early Curled	D. M. Ferry & Co	82	18,371	15,064
	SQUASH.				
2013	Early Bush Scallop	Hiram Sibley & Co	74	331	245

	MELON—WATER.				
2014	Mountain Sweet	Jerome B. Rice & Co.	46	291	134
2015	" "	Hiram Sibley & Co.	64	255	163
2016	" "	D. M. Ferry & Co.	86	276	237
	MELON—MUSK.				
2017	Rice's Surprise	Jerome B. Rice & Co.	74	1,115	825

SEEDS DIRECT FROM SEEDSMEN VERSUS SEEDS FROM COMMISSION MEN.

In order to show the average vitality of the various kinds of seeds tested, and to compare the average germination of seeds from seedsmen direct with those from commission men, the following table (Table VII) has been compiled from the two just preceding. In this table are included all varieties of seed, purchased for fresh, of which two or more tests were made of each kind. Here is shown the number of germinations made, the average per cent. that germinated and the average number of seeds contained in one ounce, of both seeds from commission men and from seedsmen direct.

In every instance except one, where a large number of tests of one kind were made, a higher per cent. of germination was procured from seeds direct from seedsmen than from those procured from commission men.

TABLE VIII.

As there is a difference in the vitality of different varieties of the same kind of seed, even when grown, harvested, cured and stored under the same conditions, varieties from one source should be compared with the same varieties from the other source. Table VIII. compares the same varieties in this manner. Of the six varieties of cabbage compared in the table, five show a higher vitality where procured from the seedsmen direct, than where procured of commission men. But of the four varieties of onion, every one shows a better germination of seed from grocers than from seedsmen direct. In nearly every other instance the result is in favor of seeds procured direct from seedsmen.

In the second column from the right, in this table, is given the difference in germination of the seeds from the two sources. When the sign minus (—) is placed before the number, the seeds from commission men produced the best germination, by the amount indicated by the number. The sign plus (+) shows the greater germination to have been produced by seeds from seedsmen direct.

In the last column on the right, minus (—) indicates a greater number of seeds per ounce of those from commission men; plus (+) indicates a greater number per ounce of those from seedsmen.

TABLE IX.

That any difference in the quality of the same varieties of seeds from different seedsmen may not be thought the source of difference in results, the same varieties put up by the *same* seedsmen and procured from both sources are placed for comparison in Table IX. It will be observed that the results do not differ materially from those obtained by comparing the same varieties from several seedsmen, as given in Table VIII.

SEED TESTS.—TABLE VII.—AVERAGE GERMINATION OF DIFFERENT VARIETIES AND COMPARISON OF COMMISSION SEEDS WITH THOSE FROM SEEDSMEN DIRECT.

Variety.	Seeds from commissionmen.			Seeds from seedsmen.		
	Number of tests.	Average per cent. germinated.	Average number of seeds in one ounce.	Number of tests.	Average per cent. germinated.	Av'age number of seeds in one ounce.
Cabbage	19	40.74	8,049	156	78.90	7,737
Radish	5	24.00	3,022	35	64.86	3,034
Cauliflower	4	44.00	8,307	20	50.09	7,972
Lettuce	1	82.00	15,064	28	61.57	23,519
Turnip..	8	61.00	14,884	12	87.67	16,235
Union	10	41.20	8,244	50	27.36	7,947
Tomato	13	53.08	9,474	2	91.50	
Pepper	2	36.00	4,479	6	41.00	4,649
Egg Plant	2	8.00	7,214	1	8.00	7,484
Parsnip	1	32.00	6,350	2	18.55	6,500
Carrot	5	39.60	13,336			
Melon—water	3	65.33	274			
" musk	1	76.00	1,115	1	76.00	1,134
Bean				41	82.40	82
Pea				26	63.42	127
Salsify				4	50.00	3,199
Cress				2	48.00	13,891
Ruta Baga				2	12.00	8,561

SEED TESTS.—TABLE VIII.—COMPARISON OF AVERAGE GERMINATION OF ALL TESTS OF SAME VARIETIES FROM COMMISSION MEN AND DIFFERENT SEEDSMEN.

Variety.	From commission men.			Direct from seedsmen.			Difference in per cent. germinated, increase or decrease, + or —.	Difference in number of seeds in one ounce, increase or decrease, + or —.
	Number of packets tested.	Average per cent. germinated.	Average number of seeds in one ounce.	Number of packets tested.	Average per cent. germinated.	Average number of seeds in one ounce.		
CABBAGE.								
Henderson's Early Summer	1	70.0	7,031	14	59.0	7,939	—11.0	+ 908
Early Winningstadt	2	56.0	8,232	4	87.0	9,355	+31.0	+1123
Marblehead Mammoth Drumhead	1	22.0	6,917	4	74.4	7,881	+52.5	+ 964
Late Flat Dutch	2	41.0	7,541	4	87.5	7,261	+46.5	— 280
Early Flat Dutch	2	47.0	8,924	4	86.0	7,450	+39.0	— 474
Early York	2	35.0	8,647	1	86.0	7,314	+51.0	—1333
TOMATO.								
Acme	1	50.0	9.649	2	91.5	....	+41.5	....
RADISH.								
Chinese Rose Winter	2	46.0	3,331	1	74.0	2,986	+28.0	— 345
Early Scarlet Turnip	1	0.0	2,948	2	35.0	3,288	+35.0	+ 340
Early Long Scarlet	1	16.0	2,013	3	34.0	2,325	+18.0	+ 312
French Breakfast	1	12.0	3,487	1	96.0	3,440	+84.0	— 47
TURNIP.								
Yellow Aberdeen	1	2.0	12,928	1	88.0	12,928	+86.0	0
Early Red Top Strap-Leaved	1	94.0	18,251	1	98.0	14,742	+ 4.0	—3515

ONION.								
Early Red	1	34.0	7,938	2	4.0	6,804	—30.0	—1134
Large Red Wethersfield	4	50.5	7,928	6	18.3	7,276	—32.2	— 652
Yellow Danvers	3	42.0	8,398	12	30.0	8,531	—12.0	+ 133
White Silver Skin	2	25.0	8,278	3	17.3	8,127	— 7.5	— 151
CAULIFLOWER.								
Early Snowball	1	78.0	6,691	8	57.3	7,598	—20.5	+ 907
Early Erfurt	2	35.0	9,582	5	46.5	8,006	+11.5	—1576
EGG PLANT.								
New York Purple	1	6.0	7,258	1	8.0	7,484	+ 2.0	+ 226
PEPPER.								
Bell or Bull Nose	2	36.0	4,479	1	36.0	3,969	0	— 510
PARSNIP.								
Hollow Crown	1	32.0	6,350	2	15.0	5,500	—17.0	— 850

SEED TESTS.—TABLE IX.—COMPARING SAME VARIETIES FROM COMMISSION MEN AND FROM SEEDSMEN DIRECT, BUT PUT UP BY THE SAME SEEDSMEN.

Variety.	Put up by—	Commission.		Direct.	
		Germinated—per cent.	Number seeds per ounce.	Germinated—per cent.	Number seeds per ounce.
CABBAGE.					
Large Late Flat Dutch	Hiram Sibley & Co.	8	7,484	86	7,484
Premium Large Drumhead *	D. M. Ferry & Co.	58	7,200	88	8,392
Improved American Savoy	same	26	8,165	86	12,928
Marblehead Mammoth Drumhead	same	22	6,917	70	9,412
ONION.					
Large Red Wethersfield †	D. M. Ferry & Co.	74	7,825	13	7,938
Yellow Danvers	same	44	8,959	42	9,072
Yellow Danvers	Hiram Sibley & Co.	32	8,845	6	9,526

* Two packets from commission men and one from seedsmen.
† Two packets from commission men and two from seedsmen.

NEW AND OLD LETTUCE SEED.

Several packets of Lettuce seed that were tested in 1884 were tested again in 1885. The results of these tests are given in Table X.

In this table the weight of the seed or number of seeds in one ounce is given, and the per cent. that germinated in 1884 and in 1885 in parallel columns for comparison; also the number of seeds in one ounce that would germinate, estimated from the weight of the seed in 1885 and the per cents. that germinated in 1884 and 1885. There is no uniformity in the results, the per cent. of sprouted seed being higher in 1884 than in 1885 in many cases, while in others the reverse is true. The average of the sixteen tests for 1884 was 53.25 per cent. of germinated seed, and for 1885 only 45.50 per cent., a difference of 7.75 in the per cent. germinated.

SEED TESTS.—TABLE X.—LETTUCE GERMINATED IN 1884 AND 1885.

Test number.	Variety.	From—	Germinated —per cent.		Number seeds in one ounce.	Number seeds germinated in one ounce.	
			1884.	1885.	1885.	1884.	1885.
2056	Monstrous Crown Cos	Vilmorin, Andrieux et Cie	76	84	27,443	20,857	23,052
2057	White Paris Cos	same	64	86	39,690	25,402	34,133
1058	Red Besson	same	62	78	25,402	15,749	19,814
2062	Turkish or Butter	same	32	74	27,443	8,782	20,308
2063	Stone Tennis Ball	same	22	6	27,443	6,037	1,647
2064	White Tennis Ball	same	18	20	27,896	5,021	5,579
2066	White Tennis Ball	Peter Henderson & Co	92	86	27,216	25,039	23,406
2070	Bloomsdale Reliable	D. Landreth & Sons	68	98	27,896	18,969	27,338
2074	Hammersmith	Vilmorin, Andrieux et Cie	40	46	32,432	12,973	14,919
2075	Brown Winter Cabbage	same	86	66	32,432	27,892	21,405
2076	Neapolitan Cabbage	same	14	2	26,082	3,651	522
2081	Landreth's Forcing	D. Landreth & Sons	12	6	20,412	2,449	1,225
2084	White Batavian	Vilmorin, Andrieux et Cie	42	0	22,680	9,526	0
2086	Large White Stone	same	76	38	23,360	8,877	8,877
2088	Brown Geneva	same	60	18	22,906	13,744	4,123
2095	The Deacon	Joseph Harris	88	20	28,350	24,948	5,670

IMPURITIES IN SEEDS.

The value of seeds for planting detoriates in a geometric ratio with the quantity of impurities they contain. Not only is it necessary that, to fill their purpose, seeds shall grow when planted under favorable conditions, but also that they shall be what they purport to be, and nothing else. In sowing wheat or grass the ground should not be seeded with cockle or plantain or other foul weeds.

There has been a complaint of long standing against the method of the Department of Agriculture at Washington, D. C., of sending out seeds; that in these distributions seeds of pernicious weeds have been scattered over the farms of the United States, and into regions where they were before unknown. With a view towards determining the character and quantity of impurities in the wheat distributed by the Department, several packages were carefully examined, and the impurities removed and weighed. From these examinations it appears that the amount of impurities with the wheat have been thought much greater than the examinations reveal. On the other hand the character of the impurities in the form of foreign seeds (*i. e.*, other than wheat) is bad enough, although not of as great variety as might be expected.

Just what besides wheat the packages contained, and the exact amounts of the various impurities are shown below. The number of seeds of each species in one bushel of wheat—calculated from the number found in one quart—is given after the name of the seed. The quantity of each kind of the impurities is given in decimals of one per cent.

The greatest total amount of impurities found in any one sample of wheat was less than .5 of 1 per cent.; the least found was a little more than .02 of 1 per cent.; the average for the eight samples, less than .16 of 1 per cent.

Packages of one quart each were examined. The package of Michigan Amber was sent out from the Department in 1884; the others were sent out in 1885. The greatest amount of impurities was found in the wheat distributed in 1884, which may be taken as indicating that an effort is being made to secure better seeds for distribution.

I. MICHIGAN AMBER—1884.

	Decimal parts of 1 per cent.
Chaff from wheat	.0758
Chess (*Bromus secalinus*) 9,248 seeds	.2777
Cockle (*Lychnis githago*) 1,888 seeds	.0609
Oat (*Avena sativa*) 160 seeds	.0117
Barley (*Hordeum vulgar*) 32 seeds	.0040
Sow Thistle (*Sonchus*) 32 seeds	.0001
Earth and dust	.0254
Total impurities	.4556

II. GENOESE—1885.

Chaff from wheat	.0108
Oat (*Avena sativa*) and barley (*Hordeum*) 32 seeds each	.0053
Fragments of stone	.0081
Total impurities	.0242

III. INDIAN—1885.

Miscellaneous seeds	.0135
Chaff from wheat, dust and dirt	.0353
Total impurities	.0488

IV. MARTIN'S AMBER—1885.

	Decimal parts of 1 per cent.
Chaff and joints of straw from wheat	.0111
Chess (*Bromus secalinus*) 252 seeds	.0080
Cockle (*Lychnis githago*) 512 seeds	.0180
Oat (*Avena sativa*) 128 seeds	.0116
Rye (*Secale cerale*) 32 seeds	.0020
Garlic (*Allium vineale*) 192 bulblets	.0183
Dust, pieces of weed stems	.0166
Two specimens, not determined, 64 seeds	.0009
Total impurities	.0865

V. EXTRA EARLY OAKLEY—1885.

Dust, chaff and crushed seeds (32)	.0081
Garlic (*Allium vinale*) 704 bulblets	.0374
Total impurities	.0455

VI. McGHEE'S WHITE—1885.

Chaff from wheat	.0074
Cockle (*Lychnis githago*) 576 seeds	.0273
Oat (*Avena sativa*) 32 seeds	.0047
Garlic (*Allium vineale*) 160 bulblets	.0073
Dust, sand, etc	.0261
Smutted wheat, 640 kernels	.0192
Not determined, 704 seeds	.0474
Not determined, 160 seeds	.0120
Total impurities	.1514

VII. DIEHL—MEDITERRANEAN—1885.

Chaff from wheat	.0018
Chess (*Bromus secalinus*) 352 seeds	.0108
Rye (*Secale cereale*) 256 seeds	.0186
Not determined	.0046
Dust and sand	.0012
Total impurities	.0370

VIII. DIEHL—MEDITERRANEAN (Houghton Farm)—1885.

Chaff, pieces of straw and weeds	.0289
Chess (*Bromus secalinus*) 3,360 seeds	.1126
Oat (*Avena sativa*) 480 seeds	.0511
Rye (*Secale cereale*) 1,824 seeds	.1752
Cockle and several species of *Polyganaceæ*	.0055
Dust and sand	.0185
Total impurities	.3918

An examination of the above tables will impress one with the fact that a very large number of foreign seeds may be present in wheat, and yet constitute but a very small per cent. of impurities. Thus, in Sample I. it is shown that seed of Chess or Cheat (*Bromus secalinus*) may be in wheat to the extent of 9,000 per bushel, but make less than .2 of 1 per cent. Cockle (*Lychius githago*) at the rate of 2,000 seeds per bushel, makes but a little more than .06 of 1 per cent of foreign seeds. It would take 320,000 seeds of Sow Thistle (*Sonchus*) to make 1 per cent of impurities in a bushel of wheat. From Sample VIII. it may be seen that rye or oats in wheat at the rate of 1,000 seeds per bushel would constitute but about .1 of 1 per cent. of impurities.

REPORT ON INSECTS.

In previous reports quite full descriptive notes have been given of the more common insects injurious to farm and garden crops, together with a discussion of the practical remedies for the same.

During the past year special observations have been made regarding the best methods of using certain well known insecticide substances, and the efficiency of different mechanical contrivances for this purpose, has been thoroughly tested.

NOTES OF THE YEAR.

Under this general head will be given brief notes and observations made the past season on such insects as have already been described.

THE CURRANT WORM (*Nematus ventricosus.*)

For this troublesome and persistent enemy white hellebore was used. The first application was made May 14th, followed by others from time to time, until the last of June. As a rule the applications were made about one week apart, although the intervals depended to some extent upon the character of the weather.

In all, six applications were made. It required one and one-half hours for one man to go over one-half acre of currants and gooseberries each time. The hellebore was applied by means of a bellows. Several patterns were tested, that of Woodason giving the best results. By means of this contrivance the poison was finely divided and economically distributed. The bellows is the invention of Thomas Woodason, Chicago.

Kerosene emulsion had no perceptible effect upon the currant worm, but injured the leaves of the bushes to some extent.

THE CANKER WORM (*Anisopteryx vernata.*)

The following letter came to the Station May 19th:

ATHENS, O., *May* 17, 1885.

Prof. William R. Lazenby:

DEAR SIR: The canker worms have again made their appearance in my apple orchard. According to your former instruction I plowed up the ground in the winter of '83 and hand grubbed around the trees. The following spring a few insects made their appearance. I sprinkled the trees with a wash, although I thought there were so few worms they would do no harm. Now the worms are very numerous. Can you not send me a pump and hose to sprinkle the whole trees?

If you can not send me some remedy they will destroy my orchard and then spread over the whole county.

They are just commencing their depredations and will continue from ten to fifteen days If I get no relief my orchard must go. It contains fifteen acres of fine fruit trees.

Yours respectfully,
ISAAC RADFORD.

In response to this letter Mr. W. B. Alwood, of the Station, was immediately sent to investigate the matter and see what could be done. He arrived at Mr. Radford's May 20th and found the orchard, a fine one of about 800 trees, badly infested. The trees were literally alive with worms, there being scarcely a leaf free from them. Mr. Alwood took with him an ordinary double action spray pump, a quantity of Paris green, London purple, and material for making a kerosene emulsion.

An emulsion consisting of kerosene, whale oil soap and water, according to the formula published by Prof. Riley, was prepared. This was diluted with twenty times its bulk of water and applied immediately by means of the force pump.

The pump had a discharge hose 12 feet in length, fitted with a cyclone nozzle. This was fastened to a stout pole so that it could be elevated, and thus cause a fine spray to reach every part of the trees. The diluted kerosene emulsion was put into a barrel which was mounted on a wagon.

One man drove and worked the pump, another one handled the nozzle. In this way the work was done quite rapidly, the wagon being driven between the rows of trees, one-half of each row being sprayed in its passage. Instructions were given to thoroughly perform this work and if it did not prove effectual to apply a solution of Paris green, at the rate of one pound to every gallons of water. In a few days thereafter Mr. Radford wrote as follows:

"The spraying of the trees with kerosene and soap did not seem to be very effective. I waited about thirty hours after the application and could not see much diminution of the worms. I then hastily sprayed the trees with the Paris green, making the solution as recommended.

"Upon a few rows I used London purple in the same manner.

"To my great surprise and delight, in twenty hours there were but few worms to be seen, and in thirty-six hours, strange as it may appear, there was not one to be found.

"The neighbors say it was the most magical thing they ever saw, for they have seen the orchard denuded each season for the past three or four years.

"In conclusion, I must say that I have not language to express my gratitude to you and the Station, through whose energies my orchards have been saved."

In the First Annual Report of the Station, a full description of the canker worm is given, and the following remedial measures are recommended:

As the female moth cannot fly, and is obliged to crawl up the tree in order to deposit her eggs where they will work injury, it is evident that if her passage be obstructed, the tree will be saved. How to place a cheap and effective barrier about the tree is the problem to solve. Probably the best substance by which this purpose can be effected is tar. Paper bands about eight inches wide should be tacked around the tree close to the ground A circle of tar should be smeared around these, which must be renewed as rapidly as it becomes dry. Some have used cheap molasses and printer's ink with good results. If one has many trees to protect, a cheaper and better remedy is to syringe or sprinkle them with a solution of Paris green or London purple, just as has been described for the coddling moth. Shaking the worms from the tree upon a light coat of straw, which is immediately burned, is a remedy practiced with good results in some places. Something may be done in the way of lessening the number of the pests by plowing or digging up the ground about the trees just before the frost comes. By so doing many of the pupa are exposed and killed for want of protection. Hogs will help to turn and overturn the soil, especially if pains be taken to scatter a little corn through it.

It will be seen from the experience of Mr. Radford that where preventive measures have been neglected, and the eggs of the canker worm permitted to hatch, that the Paris green remedy can be effectually employed.

It is more than probable, however, that here as well as elsewhere, "Prevention is better than cure."

Plum Curculio (*Contrachelus nenuphar.*)

Several applications of kerosene emulsion were made to plum trees after it was seen that the fruit was stung by the curculio. This treatment had no effect as all of the fruit dropped. A solution of Paris green used in the same way gave equally unsatisfactory results. Had these remedial agents been applied at an earlier date, the effect might have been different.

Potato Beetle (*Doryphora* 10 *lineata.*)

This well known pest was quite thoroughly destroyed by using one teaspoonful of Paris green to every ten quarts of water.

The Paris green must be of good quality, or a solution of the strength named above will not prove satisfactory.

Kerosene emulsion was thoroughly applied as a remedy for the potato beetle, but it had no apparent effect. The emulsion was diluted twenty times, which was about as strong as could be safely used.

Cabbage Worm (*Pieris rapæ.*)

This enemy maintains its ground well, and proved very troublesome the past season.

A large number of remedies were tried. The following experiments are briefly reported:

Experiments 1–5.—Dry bran, salt (both coarse and fine), lime, sulphur, and white hellebore were thoroughly applied at different times and under various conditions. None of them proved effective.

Experiment 6.—One pound of whale-oil soap boiled in one gallon of water, and diluted with three times its bulk of water, was applied with a spray-pump. Several applications were made. Many of the worms were killed, but enough remained to seriously injure the crop. This remedy, although safe cannot be recommended as a specific. Preparing the solution sometime before using, and allowing it to become more or less putrid increases its efficiency.

Experiment 7.—Ice water was thoroughly tested. It was applied at different times, but as a rule, did little or no good. When applied during the hottest portion of the day it dislodged some of the worms that happened to be on the outer leaves, but failed to have any lasting effect upon those more in the center of the plant. Worms were seen to rapidly recover after being completely immersed for several seconds in ice water.

Experiment 8.—One half ounce of pyrethrum to 15 quarts of water, applied with a spray pump, having a cyclone nozzle, proved an almost perfect remedy. Only one application was made. Although a few worms appeared subsequently they were not in sufficient number to do any special injury.

Experiment 10.—Used in the form of powder, with a small bellows, one ounce of pyrethrum proved sufficient for 150 cabbages. Twelve hours after this application was made, a careful examination showed that no live worms could be found. No further application was found necessary.

Experiment 11.—One ounce of pyrethrum and one ounce of fine air-slaked lime were thoroughly mixed. This mixture was applied in the same manner and same quantity as noted in Experiment 10. The results were equally satisfactory, and the application less expensive.

Experiment 12.—One ounce of pyrethrum with four ounces of buckwheat flour was found to be very efficient. The mixture was carefully made and applied with the Woodason bellows. The work was done very rapidly, one man being able to thoroughly sprinkle, at the rate of three acres of cabbages per day. This was the most practical remedy tried, being effectual, cheap, easy of application and harmless to the plant.

Experiment 13.—One part of Paris green thoroughly mixed with twenty parts of fine slaked lime was nearly as effective as pyrethrum. This was applied August 14, before the cabbages had begun to form heads. Although it proved effectual, the danger of using Paris green upon any food plant makes it a remedy that cannot be strongly recommended. When used at all, great caution must be exercised.

Experiment 14—Kerosene emulsions of various strength were carefully tested. The results were unsatisfactory. Equal parts of kerosene and water killed the worms, but at the same time nearly ruined the cabbages. Weaker applications affected the worms for a short time, according to the proportion of kerosene used, but they usually revived and continued their depredations.

SQUASH BUG (*Anasa tristis*).

These were quite abundant and troublesome. White hellebore, Paris green and London purple were used. The last two mixed with twenty parts of lime, and applied with a powder bellows, were very satisfactory. The application had to be repeated several times during the season.

SQUASH VINE BORER (*Ægeria cucurbitæ*).

This destructive insect was discovered soon after the middle of July, when it was found to be working serious injury to the squash vines. Several remedial agents were immediately tried. These were injected into the soil close to the stem of the affected plants by means of an injection pump constructed on the principle of a hand corn planter. The substances used were kerosene emulsions of different strength, Paris green solution, lime water and a solution of a mixture of Paris green and lime.

The kerosene emulsions had little or no effect. A solution of Paris green, one tablespoonful to ten quarts of water, proved a partial remedy as did lime water.

The best results were secured by a mixture of one part of Paris green and twenty parts of lime in a watery solution.

This mixture when thoroughly injected around an affected stem checked the work of the borer. It is believed that this will prove a very efficient remedy, but further experiments are necessary before its merits can be definitely known.

Polysolve for the Scale Insects.

Polysolve, from Brustlein, Surry & Co., which is recommended as a remedy for scale insects was tried upon an Ivy, the leaves of which were nearly covered with scales. The polysolve was found to be quite effective in loosening the scales, and destroyed the insects when exposed. It was found to be necessary to rub the leaves with a sponge or cloth when the material was applied. By these means the scales were easily loosened, and the insects destroyed. The polysolve was not tried on trees out of doors as the scale insects which were so numerous in 1884 had almost disappeared. It is more especially adapted to be used on in-door plants, or small shrubs than upon large trees, although it would undoubtedly be useful upon any plant infested by scale insects.

GRASSHOPPERS OR LOCUSTS.

In many sections of the State these insects proved quite injurious the past season. As a rule, they were the most troublesome to the oat crop, and quite serious losses have been reported. There seems to be little doubt that they are on the increase, and the comparatively mild winter just passed is favorable to their rapid multiplication.

A hot, dry summer is also favorable, and if these conditions obtain serious losses are likely to occur. About the only practical method of fighting the common grasshopper is to aim at the destruction of the eggs. Fall or winter plowing is often a ready means of accomplishing this end. Harrowing is also quite effectual.

After the insects have made their appearance chickens and turkeys, if allowed to run at large, will destroy great numbers, and derive nearly their whole subsistence from them.

ARMY WORM (*Leucania unipuncta.*)

Correspondents from several different sections of the State reported this insect as quite abundant and injurious the past season.

Mr. Emmett Mix, President of the Board of Control of the Station, who resides in Franklin county, about six miles west of Columbus, wrote as follows:

AVENUE, *July* 27, 1885.

Prof. W. R. Lazenby:

DEAR SIR: Within the last three days a worm has been at work on my oats and has destroyed at least one-half of the crop. The worm is about one and one-fourth inches long, usually of a dark brown color, though some are lighter and some even darker than a dark brown.

They climb the stalk and eat the oats off. The ground is literally covered with the grain, which is a total loss. What are they, and how long do they continue their depredations? An early answer is desirable.

In response to this letter Prof. N. S. Townshend and the Director of the Station visited the farm of Mr. Mix the following day. It was then seen that the insect in question was the army worm, and that the injury being done was fully as great as reported.

Although the oats were scarcely mature enough to harvest, cutting them immediately appeared to be the most practical remedy, and this was recommended.

July 20th Mr. Mix wrote as follows:

"On examining, the following morning, the oats cut the day you were here I found that the worms had eaten large quantities from the gavel as they lay on the ground unbound. In many places fully a pint of grain to each gavel could be found. Under one gavel I counted 87 worms of all sizes, from two inches down to one-quarter of an inch in length.

"I am obliged to let the oats lay until partially cured, as they would damage if not completely spoil, if bound up without curing.

"Some shocks put up last night have worms all through them, and in taking them down a considerable quantity of oats shake out from each bundle.

"They are not so badly injured, I think, as those left on the ground unbound I am still in doubt as to the best plan to pursue, but will await further developments and report.

"There seems to be no perceptible decrease in numbers. If any die others take their places. The extent of the injury is more marked as the oats decrease."

August 3d Mr. Mix wrote as follows:

"The work of the army worm on my oat crop seems to diminish, as the oats which remain uncut approach maturity. They appear to prefer oats that are green or in the milk. The variety known as White Russian has suffered much more than other varieties. Oats on black ground have suffered more than those on clay ground, because later in maturing. In many low places in the field there is nothing but straw left standing. The worms do not bother the shocked oats very much and I shall continue cutting as rapidly as possible.

"The grass in the fence corners of the oat field in many places is entirely gone. Blue grass appears to have suffered the most and is their favorite food.

"Hogs and chickens are devouring vast numbers of the worms. The only crop injured, so far as I have heard, is oats and only certain fields of these.

"About one-half the fields in my neighborhood are attacked.

"In some places the grasshoppers are doing almost if not quite as much injury. This is especially the case where the oat fields adjoin meadows recently cut."

The following brief history of this not uncommon pest may be of interest:

"The perfect insect is a light brownish or fawn colored moth. The female deposits her eggs in spring, usually between the folded sides of a dry blade of grass.

"The eggs hatch in about ten days and the worm, unless very abundant, has much the same habit as the well known cut worm.

"When very numerous they acquire the marching habit. Wet springs, preceded by one or more dry summers, appear to be favorable to their rapid multiplication. They are seldom abundant any two consecutive years.

"When so abundant as to invade any particular locality crops may be saved by plowing trenches in front of the marching hosts, and in these scattering freshly cut June grass or red top, sprinkling the same with a solution of Paris green. The worms are very voracious and are readily poisoned.

REPORT ON WEEDS.

There are few objects in nature better understood, in a general way, than that class of plants denominated weeds. Yet definite and correct knowledge regarding the history, habits of growth, etc., of these intruders is rarely to be found.

In former reports the Station has given a full description of many of the worst species and has treated of the following subjects:

1. Methods by which weeds are disseminated and propagated.
2. Habit of growth and duration of life.
3. The best methods of destruction.

The investigations the past year have included the following additional points:

1. Adaptability of weeds to certain soils.
2. A classified list of the weedy plants of the State.

In addition to this, descriptive notes of some of the more troublesome and least known species are given, also some further observations on the prolificacy of certain weedy plants.

WEEDS ON DIFFERENT SOILS.

A very little observation shows that different plants are partial to some particular variety of soil.

It is true that many species have a wide range and are found under a great variety of conditions, as regards soil and climate, but the fact remains that the growth of weeds is very largely affected by differences of soil alone. That is, clays, limestones, sands, peats, and a mixture of two or more of these, which goes under the common name of a loamy soil, will each produce some weeds peculiar to itself.

The weedy plants of the State are distributed, according to soil, nearly as follows:

Weeds of clays, ...	About 10 per cent.
Weeds of limestones, ...	About 20 per cent.
Weeds of sandy soils, ...	About 15 per cent.
Weeds of peats or vegetable moulds, ...	About 15 per cent.
Weeds of mixed loams, ...	About 40 per cent.

The different kinds of soil just mentioned not only present different species of weeds, but produce them in different proportions, as regards quantity or number of individuals.

As a rule, the weeds of clays and sandy soils are neither so plentiful nor so luxuriant as those of limestones and mixed loams, hence they are less troublesome. Our loams, which are usually the most fertile soils, naturally produce a greater abundance and a greater variety of weeds than soils of a less productive character.

Whether a soil be poor or rich, weeds by occupying space and appropriating food, lessen the yield of crops.

It should also be borne in mind that by allowing weeds to perfect their seeds, they cause still greater exhaustion of the soil, besides preparing the way for their reappearance.

The classified list of weeds appended to this report contains some suggestive notes as to the habits and localities of the different species.

GENERAL REMARKS.

Life is a constant struggle for existence. This is just as true of the vegetable as of the animal kingdom. The weak succumb and only the fittest survive, and to-day the farmer has to contend with the weeds that have been combatted with plow, with scythe and with hoe, and have survived and multiplied their kind. On the other hand, the farm crops have been given every opportunity to grow until they have been brought to the present high state of perfection. If the issue between the weeds and farm crops as to which shall occupy the land is left to be settled by them, the weeds invariably come off victors.

In order to make preparation for a battle, one must have knowledge of the character and strength of the enemy, and the more thorough our knowledge of the peculiar habits of the weeds against which we are to battle the more efficacious should be the blows we deal.

There are three points concerning weeds that are of the deepest practical interest to the farmer, viz.: How the weeds get on the farm; the character and amount of injury they are likely to cause; and how to get rid of them.

The following descriptive notes have been prepared with the hope that they may be of assistance to those who desire a better knowledge of the particular species mentioned, and with which every cultivator of the soil may sooner or later have to contend.

The seeds of scores of species of foreign plants are emptied upon our shores each year in the ballast deposits left about our principal sea-ports by vessels from foreign countries,—largely from Europe, but also from many other countries. A great many come as impurities in seeds purchased in foreign countries, and in straw, chaff, hay, etc., used for packing many kinds of goods shipped here. Still, others are imported with the expectation that they will supply a real or supoosed need, and afterwards abandoned or allowed to escape and become troublesome weeds.

DESCRIPTIVE NOTES OF TROUBLESOME SPECIES.

WILD PARSNIP (*Pastinaca sativa*, L)

Root biennial, spindle-shaped, hard or fleshy, acrid, poisonous. Plant light or yellowish-green, two to six feet high; stem furrowed or grooved, somewhat branching, mostly along the upper part. Leaves downy beneath, somewhat shining above, pinnate with three or four pairs of sessile leaflets two to four inches long, incisely toothed, rather blunt pointed, and a terminal petiolulate odd leaflet, three-lobed. The small yellow flowers are borne in large umbels or flat-topped clusters, terminating the stem and branches, the latter usually rising as high as, or above the end of the stem. There is no involucre nor involucel. The five teeth of the calyx are very small or wanting. The yellow petals are broadly lance-shaped, the long slender point rolled inward. The fruit is thin, flatly compressed, and consists of two oval disk-like seeds, with broad wing-like margins. Between the thread-like ribs on the side of the seed are yellowish-green channels marked with slender purplish lines—the oil-tubes. Blooms in June, July and August, and first fruit ripens in August. Native of Europe.

This is merely a degenerate form of the garden parsnip, escaped from the gardens and "run wild."

The root has become dwindled in size, hard, branching and poisonous. It is very prolific; 19,000 seeds were counted upon a single large plant, and two smaller plants bore 4,834 and 8,080 seeds respectively. These are carried by streams and rivers so that in the rich alluvial bottoms the plant has become a great pest; sometimes when left to itself it takes complete possession of portions of the land. It can not be exterminated without the closest attention being given to keeping it mowed or plowed under so that it cannot develope leaves or ripen seeds. Its rapid multiplication along railroads and public highways is frequently the cause of unmeasured trouble on the adjoining farms, to which it sooner or later finds its way.

The State law for the destruction of weeds along the public roads and railroads should no longer be a dead letter, as it now is in so many districts, then there would be less cause for complaint from this and many other useless weeds.

THORNY OR SPINY AMARANTH. ARMY WEED (*Amarantus spinosus*, L.)

An annual, growing one to three feet high, bushy-branched; stem smooth, often reddish or purple. Leaves dull green, one to two inches long, obtuse at the apex, tapering at the base into a petiole about as long as the leaves; margins entire. At the axil of each leaf is a pair of sharp, straight, slender spines, one-fourth to one-half an inch long. Flowers numerous, small, greenish-yellow, the fertile ones in globular clusters in the axils of the leaves, and the sterile in terminal and sub-terminal spikes. Fruit a small, hard and polished seed of a brown color and enclosed within a thin membranous covering. Blooms in August; fruit ripens in October. Native of India.

This vile foreigner was introduced into many parts of Southern Ohio from the South during the civil war, whence the name, "Army Weed," by which it is commonly known in those localities. It first made its appearance in the towns, and the seeds were carried into the surrounding country in the mud, clinging to the wheels of vehicles and in manure hauled out and spread upon the fields. The seed possesses great vitality, and will pass through animals uninjured. Stock will not feed upon it and the spines makes it so disagreeable that they will seldom graze among it.

The plants are not difficult to kill, and mowing about the time of coming into bloom destroys them. It would not be difficult to eradicate were it not that the seeds remain in the ground for a long time without germinating, or until the conditions are favorable. A little care for a few years in removing all plants before any of the seeds ripen, will gradually rid a place of them.

WILD MUSTARD. BLACK MUSTARD. YELLOW BLOW (*Sinapis nigra*, L.)

Annual, two to six feet high; stem round, smooth, much branched. Leaves scabrous, petiolate; the lower ones variously lyrate with a large terminal lobe, and dentate; the upper ones narrow, entire, drooping. Flowers in slender racemes, cruciform, about half an inch across, the sepals and petals sulphur-yellow. Pods one-half to one inch long, smooth, somewhat four-angled, closely appressed to the stem, about five-seeded. Seeds small, globous, various shades of brown to nearly black. Flowers in June and July. Seeds ripen in August. Introduced from Europe.

From the seeds of this, and another species (*S. alba*, L.), not generally escaped from cultivation, is prepared the well known condiment, mustard; and the leaves of the young plants are eaten as greens. It has escaped from cultivation and become a great nuisance in the streets of villages, along roadsides, in cultivated fields, in spring barley and oats, and in other places. Like most annuals, if cut to the ground about the time of blooming it is killed, and a very few seasons of clean culture eradicates it. The rapidity with which which it is spreading, however, indicates a shameful lack of interest and vigilance on the part of farmers into whose neighborhoods it is now making such inroads. It is not so prolific as many of the weedy plants, average plants producing 2,000 to 3,000 seeds. On large specimen found this year on the Univerity farm over 31,000 seeds were found.

HORSE-WEED. BUTTER-WEED. MARE'S TAIL. COLT'S-TAIL. MULE'S-TAIL

(*Erigeron canadense*, L)

Annual, six inches to eight feet high—commonly two to four feet high on ordinary soils. Stem erect, furrowed, branching, wand-like; whole plant bristly-hairy. Leaves one to four inches long, sessile, lance-linear, rough margined, mostly entire, the lower ones sparingly toothed, and those from the root cut-lobed. Heads of flower numerous, small, cylindrical, racemose upon the branches and constituting an oblong panicle. Rays numerous, white, inconspicuous; pappus simple, long; seeds (akenes) small. Blooms in August and September, and the first seeds ripen in September. Native of the United States.

Although believed to be a native of the United States, this weed has not yet found its way into all parts of Ohio. The high waters of 1882 and 1883 left it on farms in the southern part of the State where it was before unknown. It is very troublesome in lawns and pastures, and sometimes in meadows and cultivated fields, and is a very unsightly plant in waste places. Its hairiness gives it a dirty, hoary appearance. Not only is it common in the United States, but also in Europe, and it is said, in other regions. On a very sterile soil it will grow a few inches high and ripen seeds, and on rich land grows very large. Mowing just before or at the time of blooming will kill it, and if none are permitted to mature seeds, it requires but two or three years to rid a place of it.

MAY WEED. DOG FENNEL (*Maruta cotula*, DC.)

Annual, six to twelve inches high, erect, smooth or somewhat pilose, leafy, much branched, diffuse. Leaves alternate, one to three inches long, twice to thrice divided into numerous short, narrow, flat, pointed segments. Flowers numerous, in heads about one inch in diameter, on long pubescent peduncles, terminating the branches. Involucre hemispherical; scales many, the margins whitish. Ray flowers neutral; rays white, about fourteen, spreading at first, but soon reflexed. Disk flowers yellow, perfect. Receptacle conical or sub-cylindrical, chaffy, at least at the summit, with bristly pales shorter than the flowers. Seeds (akenes) inversely conical or oblong, smooth or slightly tuberculate in lines, ribbed. Pappus none, or a minute disk. Blooms from June until frost. Fruit ripen from August until frost. Introduced from Europe.

This is an acrid, strongly fetid weed, common in waste places, preferring dry, rather compact soils It is not very troublesome in cultivated fields, but forms large patches in farm-yards, pastures, along lanes and roadways. Farm animals will not feed upon it, but it is sometimes accidentally eaten by cows grazing among it, and imparts a bitter taste to the milk. It is said to be annoying to flies and some other insects. It branches so near the surface of the ground that it is diffiult to mow close enough to kill it. If cut off at the surface of the ground it is destroyed. Cultivation soon eradicates it. It grows in situations difficult to reach by cultivation, and is thus allowed to multiply in localities where once established.

PROLIFICACY OF WEEDS.

The examination into the fecundity of weedy plants was continued with the results recorded below. In most cases plants were taken that had fairly favorably conditions for development, so that the number of seeds given may be regarded as rather above the average as they ordinarily grow. Where plants of extraordinary growth were taken, it is so stated in the notes upon it. Not until we learn something of the enormous numbers of seeds produced by some of our weedy plants, can we comprehend the full significance of the adage, "One year's seeding makes seven year's weeding."

The seeds upon two plants of Wild Parsnip (*Pastinaca sativa*, L.) were counted, and found to be 8,080 and 4,834 respectively. A large plant bore 19,000 seeds.

A plant of Pepper Grass or Tongue Grass (*Lepidium Virginicum*, L.), a little above the average size, bore 13,500 silicles or seed pods, each of which contained two seeds, making a total of 27.000 seeds as the product of the plant.

A rather large plant of Sour Dock, Curly Dock, Narrow Dock or "Greens" (*Rumex crispus*, L.) bore 36,900 seeds.

Upon one plant of Shepherd's Purse (*Capsella Bursa-pastoris*, Mœnch) were found 3,100 silicles, containing an average of 25 seeds each,—ascertained by taking 20 silicles from the plant at random, and counting the seeds in each,—making 77,500 the total number of seeds produced. Another plant bore 2,500 silicles, or 62,500 seeds, the average number of seeds per silicle being the same in both plants.

A plant of Bearded Plantain (*Plantago aristata*, Mx.), a species recently introduced from the West in grass seed, and now spreading rapidly in meadows, bore 4,240 seeds.

A very large specimen of Bur-dock (*Lappa major*, Gærtn.), found at the intersection of two streets in Columbus was 7½ feet high, and the branches spread 9 feet. It bore 720 large heads of flowers, likely to produce the average number of seeds; and 364 smaller heads, not mature enough to determine the quantity of seeds that they might produce. The average number of seeds (akenes) produced by each head, determined the previous season, was 556, making a total of 400,328 seeds the second year of its existence, the plant being a biennial.

The Bristly Fox-tail Grass (*Setaria glauca*, Beauv.), also known by the names of Barn Grass, Summer Grass, Pigeon Grass, etc., is very prolific. Eighty-two spikes of seeds were found upon one plant. The number of seeds upon 10 spikes were counted. The largest number found was 387, and the smallest number 87, there being many immature seeds on the latter, not included in the number given. The average number of seeds per spike was 237.8, giving a total of 19,499 seeds for the whole plant.

A large specimen of Green Fox-tail Grass or Bottle Grass (*Setaria viridis*, Beauv.) had on it 149 spikes. The largest number of seeds found on one spike was 555, the smallest number 90, and the average 309. The total number was thus estimated to be 46,041 seeds.

Upon a large plant of Hedge Mustard (*Sisymbrium officinale*, Scop.) 1,668 siliques or seeds pods were found, containing an average of 14.2 seeds each, or 23.685 seeds on the plant. The largest number of seeds found in one silique was 20; the smallest number was 8.

A large plant of Wild Mustard (*Sinapis nigra*, L.) was found to bear 6,864 siliques. The largest number of seeds per silique was 8, and the smallest number 1; the average was 4.6, the total number thus shown to be 31,574 seeds.

A large Common Plantain (*Plantago major*, L.) bore 33 spikes each having from 139 to 448 pyxes, and each pyxis containing from two to six seeds. The average number of seeds per pyxis was 4.5 and the average number of pyxes per spike 293.4, the total number of seeds per plant being 43,569.

A specimen of Motherwort (*Leonurus cardiaca*, L.) consisted of 11 stalks with 360 to 3,432 seeds on each stalk, or an average of 1,701 per stalk. The total number of seeds was 18,711.

LIST OF THE PLANTS OF OHIO WHICH GENERALLY APPEAR AS WEEDS.

The following list of the weedy plants of the State is divided into three classes:

1. *Weeds that are universally injurious.*
2. *Weeds that are usually troublesome.*
3. *Weeds that are occasionally troublesome.*

Each class is divided into two groups, viz. (1) *Native species.* (2) *Introduced species.*

It will be observed that nearly 85 per cent. of the first class, which includes the worst weeds of the State, are introduced species.

The most general of the common names by which the weeds are known are given in the first column. The botanical or scientific name of each species is given in the middle column. In the last column are recorded the soils and situations in which the weeds chiefly occur.

CLASS I.

Common name.	Scientific name.	Where found.
	Native Species.	
Tongue- or Pepper-grass	Lepidium Virginicum, L.	Pastures, roadsides.
Evening Primrose	Œnothera biennis, L	Cultivated fields, banks of streams.
Iron-weed	Vernonia Noveboracensis, Willd.	Clay soils; pastures.
Colt's-tail	Erigeron Canadense, L.	Lawns, pastures, roadsides.
White-weed	Erigeron annuum, Pers	Meadows and pastures.
Horse-weed. Great Rag-weed	Ambrosia trifida, L	Alluvial soils; pastures.
Rag-weed. Bitter-weed	Ambrosia artemisiæfolia, L.	Cultivated soils; wheat stubble, roadsides.
Horse-nettle. Sand Brier	Solanum Carolinense, L	Sandy soil, pastures.
Common Milk-weed	Asclepias Cornuti, Decaisne	Rich soil, fields, roadsides.
Bur or Hedgehog grass	Cinchrus tribuloides, L	Sandy soil, cultivated grounds.
	Introduced Species.	
Wild Mustard. Yellow Blow	Sinapis nigra, L.	Roadsides, waste places.
Shepherd's Purse	Capsella Bursa-pastoris, Mœnch	Pastures, gardens.
Cockle	Lychnis githago, Lam.	Grain fields, especially troublesome in wheat.
Chickweed	Stellaria media, Smith	Damp, cold soils.
Corn Spurry. Tares	Spergula arvensis, L	Common on sandy and light soils.
Purslane	Portulacca oleracea, L	Rich soil; gardens.
Low Mallows. Cheeses	Malva rotundifolia, L	Gardens, lawns, roadsides and edges of fields.
Spiny Sida	Sida spinosa, L	Waste places, gardens.
Velvet-leaf. Butter-print	Abutilon avicennæ, Gærtn	Rich soil, cultivated grounds.
Stone Clover. Rabbit-foot	Trifolium arvense, L.	Thin or sandy soils.
Low Hop Clover	Trifolium procumbens, L.	Lawns, waste places.
Tree Clover. Bokhara Clover.	Melilotus alba, Lam	Cultivated grounds, roadsides.
Common Vetch. Tare	Vicia sativa, L	Cultivated grounds.
Wild Carrot. Bird's Nest	Daucus carota, L.	Meadows, fields, and roadsides.
Wild Parsnip	Pastinaca sativa, L	Low ground, pastures.
Teasel	Dipsacus sylvertis, Mill	Borders of fields, roadsides.
Clot-bur	Xanthium strumarium, L	Low ground, pastures.

CLASS I.—Continued.

Common name.	Scientific name.	Where found.
	Introduced Species.	
Thorny Clot-bur	Xanthium spinosum, L	Roadsides, waste places.
May-weed. Dog Fennel	Maruta Cotula, DC.	Hard soil, roadsides.
Yarrow. Milfoil	Achillea millefolium, L	Pastures, meadows.
Ox-eye Daisy	Chrysanthemum Leucanthemum, L.	Meadows, pastures.
Common Thistle. Bull Thistle	Cirsium lanceolatum, Scop	Pastures, waste places.
Canada Thistle	Cirsium arvense, Scop.	Pastures, meadows, fields.
Burdock	Lappa major, Gærtn	Rich soil, fence-rows.
Dandelion	Taraxacum Dens-leonis, Desf.	Pastures, fields, lawns.
Sow-thistle	Sonchus asper, L	Strawberry beds, gardens.
Common Plantain	Plantago major, L.	Door-yards and lawns, pastures, fields.
Rib-grass. Narrow Plantain	Plantago lanceolata, L.	Dry pastures and meadows.
Common Mullein	Verbascum thapsus, L	Neglected pastures and meadows.
Moth Mullein	Verbascum blattaria, L.	Pastures, highways.
Toad-flax. Butter-and-eggs	Linaria vulgaris, Mill	Dry places, upland meadows.
Motherwort	Leonurus cardiaca, L.	Waste places, gardens.
Viper's Bugloss. Blue Devils	Echium valgare, L.	Roadsides, pastures.
Wheat Thief. Pigeon-weed	Lithospermum arverse, L.	Grain fields, pastures; very troublesome in wheat fields.
Hound's Tongue	Cynoglossum officinalis, L.	Shaded pastures, fence rows.
Bind-weed	Convolvulus arvensis, L.	Dry fields, pastures.
Wild Sweet Potato	Ipomœa panduratus, Meyer	Sandy fields.
Rutland Beauty	Calystegia sepium, Br	Low grounds, cultivated fields.
Jimson-weed. Thorn-apple	Datura stramonium, L	Rich soil, farm yards.
Lamb's Quarters. Pig-weed	Chenopodium album, L	Cultivated fields, waste places.
Reflexed Amaranth	Amarantus retroflexus, L	Corn fields.
Spiny Amaranth	Amarantus spinosus, L.	Cultivated fields, roadsides.
Knot-grass. Goose-grass	Polygonum aviculare, L.	About dwellings, roadways.
Curly Dock. Sour Dock	Rumex crispus, L.	Low grounds, pastures.
Field Sorrel	Rumex acetosella, L	Sandy, poor soil, pastures.
Stinging Nettle	Urtica dioica, L.	Pastures, waste places.
Slender Rush	Junctus tenuis, Willd	Beaten pastures, dry places.
Cheat. Chess	Bromus secalinus, L	Grain fields, meadows.
Couch-, Twitch-, or Quitch-grass	Triticum repens, L.	Cultivated fields; a very great pest.

Stinking Eragrostis	Eragrostis præoides, var. megastachya	Gardens, lanes.
Summer-, Fox-tail- or Pigeon-grass	Setaria glauca, Beauv	After wheat, lawns, gardens.
Green Fox-tail- or Bottle-grass	Setaria viridis, Beauv	Lawns, fields, gardens.

CLASS II.

Common name.	Scientific name.	Where found.
	Native Species.	
Abortive Crowfoot	Ranunculus abortirus, L.	Damp situations.
Poison Ivy. Poison Oak	Rhus Toxicodendron, L	Old fence-rows, wood-lots.
Green-flowered Bush-trefoil	Desmodium viridiflorum, Beck	Alluvial soils.
Norwegian Potentilla	Potentilla Norvegica, L	Pastures, roadsides.
Cinquefoil. Five-finger	Potentilla Canadensis, L	Meadows, neglected fields, poor soils.
Boneset. Thoroughwort	Eupatorium perfoliatum, L.	Wet grounds, pastures.
Starved Aster	Aster miser, L	Roadsides, pastures.
Heath-like Aster	Aster ericoides, L	Pastures, thin soils.
Rough Rudbeckia. Yellow Daisy	Rudbeckia hirta, L.	Meadows, pastures.
Actinomeris	Actinomeris squarrosa, Nutt	Fence-rows, fields.
Bur-marigold	Bidens frondosa, L.	After Indian corn, wet pastures.
Beggar-ticks. Chrysanthemum—flowered Marigold	Bidens chrysanthemoides, L.	After Indian corn, wet pastures.
Spanish Needles	Bidens bipinnata, L.	After Indian corn, along streams.
Golden Rod	Solidago Canadensis, L.	Fields, fence-rows.
Everlasting	Gnaphalium polysephalum, Mx	Old pastures.
Wild Lettuce	Lactuca Canadensis, L	Dry soils, door-yards, fence-rows.
Bearded Plantain	Plantago aristata, Mx	Meadows.
Germander	Teucrium Canadense, L	Low grounds, fence rows.
Beggar's Lice	Cynoglossum Morisoni, D C	Pastures, woodlands.
Ground Cherry	Physalis viscosa, L	Sandy grass lands.
Poke-weed. Pigeon-berry	Phytolacca decandra, L	Rich soil; barn-lots; clearings.
Milk Purslane. Spotted Spurge	Euphorbia maculata, L.	Gravelly soils, road sides, cultivated grounds.
Large Spotted Spurge	Euphorbia hypericifolia, L.	Dry, sandy fields, pastures.
Wild Hyacinth. Quamash	Scilla Fraseri, Gray	Damp pastures, river bank.
Bristle-spiked Galingale	Cyperus strigosus, L.	Wet, sandy meadows and cultivated crops.
Old-witch Grass	Panicum capillare, L.	Sandy soils, pastures.

CLASS II.—Continued.

Common name.	Scientific name.	Where found.
	Introduced Species.	
Buttercups. Tall crawfoot	Ranunculus acris, L.	Meadows, pastures.
Bulbous Buttercups	Ranunculas bulbosus, L.	Pastures.
Charlock	Sinapis arvensis, L.	Gardens, pastures.
St. John's-wort	Hypericum perforatum, L.	Dry pastures.
Bouncing Bet. Soapwort	Saponaria officinalis, L.	Waste places, along brooks.
Mouse-ear Chickweed	Cerastium vulgatum, L.	Pastures, borders of fields.
Flower-of-an-hour. Bladder Ketmia	Hibiscus trionum, L.	Gardens, cultivated grounds.
Black Medick. Nonesuch	Medicago lupulina, L.	Cultivated fields, roadsides.
Cleavers. Goose-grass	Galium aparine, L.	Moist pastures, thickets.
Elecampane	Inula helénium, L.	Roadsides, waste places.
Tansy	Tanacetum vulgare, L.	Gardens, waysides.
Chiccory	Cichorium Intybus, L.	Meadows, cultivated fields.
Speedwell	Veronica arvensis, L.	Grain fields, gardens.
Spear-mint	Mentha viridis, L.	Wet ground, waste places.
Catnip	Nepeta cataria, L	Rich soils, fence rows, fields.
Ground Ivy. Gill-over-the-ground	Nepeta glechoma, Benth	Moist, shaded places, fence rows.
Heal-all. Self-heal. Blue Curls	Brunnella vulgaris, L.	Pastures, fields.
Hoarhound	Marrubium vulgare, L	Dry, stony pastures.
Hen-bit. Dead Nettle	Lamium amplexicaule, L.	Gardens, fields, pastures.
Common Vervain	Verbena urticifolia, L.	Pastures, waysides.
Narrow-leaved Stickseed	Echinospermum lappula, Lehm	Waste places.
Flax Dodder	Cuscuta epilinum, Weihe	Flax fields, cultivated fields.
Nightshade	Solanum nigrum, L.	About dwellings, pastures, fields.
White Amarantus	Amarantus albus, L.	Barn-yards, roadsides near towns.
Black Bindweed	Polygonum convolvulus, L.	Cultivated grounds.
Lady's Thumb. Spotted Knotweed	Polygonum persicaria, L.	About dwellings, roadsides.
Bitter Dock. Broad-leaved Dock	Rumex obtusifolius, L.	Pastures, meadows.
Carb grass. Yard-grass	Eleusine Indica, Gærtn	Door-yards, lanes, pastures.
Common Crab grass. Finger-grass	Panicum sanguinale, L.	Gardens, cultivated fields.
Cock's-foot. Barnyard-grass	Panicum crus-galli, L.	Wet meadows, barn-yards.

CLASS III.

Common name.	Scientific name.	Where found.
	Native Species.	
Early Meadow Rue	Thalictrum dioicum. L	Rocky wooded pastures.
Tall Meadow Rue	Thalictrum cornuti, L.	Wet meadows.
Early Crowfoot	Ranunculus fascicularis, Muhl.	Rocky pastures.
Creeping Crowfoot	Ranunculus repens, L.	Moist or shaded meadows and pastures.
Pawpaw	Asimina triloba, Adam.	Moist pastures, hillsides.
May-apple. Mandrake	Podophyllum peltatum, L	Woodland, pastures.
Common Blue Violet	Viola Cucullata, Ait	Gardens; fence rows.
Long-leaved Stitchworth	Stellaria longifolia, Muhl	Grass-lands.
Spring Beauty	Claytonia Virginica, L	Moist open woodland pasture.
Spotted Touch-me-not	Impatiens fulva, Nutt	Shady, wet places.
Pale Touch-me-not	Impatiens pallida, Nutt	Shady, wet places.
Yellow Wood-sorrel	Oxalis stricta	Pastures, cultivated grounds.
White Clover	Trifolium repens, L.	Fruit gardens, cultivated fields.
Creeping Bush-clover	Lespedeza repens, Torr. & Gray	Dry sandy soils.
Wild Senna	Cassia Marilandica, L	Alluvial soils, pastures.
White Avens	Geum album, Gmelin	Borders of woods.
Common Blackberry	Rubus villosus, Ait	Borders of thickets, ravines, fence rows.
Dewberry. Low Blackberry	Rubus canadensis, L.	Rocky hills, pastures.
Willow-herb	Epilobium coloratum, Muhl	Low pastures.
One-seeded Star-cucumber	Sicyos augulatus, L	Wet places.
Sanicle. Black Snake-root	Sanicula Marilandica, L.	Copses.
Cow Parsnip	Heracleum lanatum, Michx	Moist, rich ground.
Spotted Cowbane. Water Hemlock	Cicuta maculata, L	Swamps and wet grounds.
Honewort	Cryptotæn a Canadensis D. C	Woodland pastures.
Common Elder	Sambucus Canadensis, L	Rich soils, pastures, fence rows.
Button-bush	Ciphalanthus occidentalis, L.	Wet pastures.
Bluets	Houstonia cærulea, L	Wet grass lands.
Joe Pye Weed. Trumpet Weed	Eupatorium purpureum, L.	Low grounds, pastures.
White Snake-root	Eupatorium ageratoides, L.	Rich, woodland pastures.
Aromatic Thoroughwort	Eupatorium aromaticum, L	Copses.
Corymbous Aster	Aster corymbosum, Ait	Woodlands.

CLASS III.—Continued.

Common name.	Scientific number.	Where found.
	Native Species.	
New England Aster	Aster Novæ Angliæ, L	Moist grounds.
Common Fleebane	Eroigern Philadelphicum, L.	Moist situations.
Large Golden-rod	Solidago gigantea, Ait	Fence rows.
Cup-plant. Leaf-cup	Silphium perfoliatum, L	Rich soils, banks of streams.
Ox-eye	Heliopsis lævis, Pers	Banks of streams.
Cone-flower	Rudbeckia laciniata, L	Low, shaded situations.
Large Wild Sunflower	Helianthus giganteus, L	Low grounds.
Wild Sunflower	Helianthus strumosus, L	River banks.
Sneeze-weed	Helenium autumnale, L	Alluvial soils.
Everlasting	Gnaphalium decurrens, Ives	Dry fields, hill-sides.
Plantain-leaved Everlasting	Antennaria plantaginifolia, Hook	Sterile knolls.
Fireweed	Erechthites hieracifolia, Raf	Newly cleared land.
Golden Ragwort. Squaw-weed	Senecio aureus, L	Low grounds.
Rough Hawkweed	Hieracium scabrum, Michx	Dry open woods.
Rattlesnake-root. White Lettuce	Nabalus albus, Hook	Rich soil, borders of woods.
Figwort	Scrophularia nodosa, L	Damp ground, banks, fence-rows.
Blue Vervain	Verbena hastata, L	Low ground, pastures, wastes.
Fog-fruit	Lippia lauceolata, Michx	River banks.
American Germander	Tuecrium Canadense, L	Damp grounds.
Wild Burgamot	Monarda fistulosa, L	Woods, fence-rows.
Hedge-Nettle	Stachys palustris, L	Wet places.
Waterleaf	Hydrophyllum Virginicum, L	Damp woods.
Waterleaf	Hydrophyllum appendiculatum	Open woods.
Miami Mist	Phacelia Purshii, Buckley	Moist clover fields, banks.
Gronovius' Dodder	Cuscuta Gronovii, Willd	Damp places, coarse herbs, low shrubs.
Glomerate Dodder	Cuscuta glomerata, Choisy	Moist prairies, Compositæ.
Ground Cherry	Physalis Philadelphica, Lamx	Rich ground, pastures, lawns.
Spreading Dogbane	Abocynum androsæmifolium, L	Borders of woods.
Swamp Milkweed	Asclepias incarnata, L	Wet grounds, creek bottoms.
Pennsylvania Knotweed	Polygonum Pennsylvanicum, L	Moist, open wet places.
Flesh-colored Knotweed	Polygonum incarnatum, Ell	Borders of streams.
Smartweed. Water-Pepper	Polygonum hydropiper, L	Moist ground.

Lizard's-tail	Saururus cernuus, L	Swamps, borders of streams.
False Nettle	Bœhmeria cylindrica, Willd	Moist grounds.
Indian Turnip	Arisæma triphyllum, Torr	Rich woods, damp pastures.
Skunk Cabbage	Symplocarpus fœtidus, Salisb	Bogs, wet pastures.
Wild Garlick	Allium Canadense, Kalm	Damp meadows.
Common or Soft Rush	Juncus effusus, L	Marshy grounds, meadows, pastures.
Galingale	Cyperus phymatoides, Muehl	Low grounds.
Sedge	Carex straminea, Schk	Open grounds.
Wood Drop-seed Grass	Muhlenbergia sylvatica, Torr. & Gray	Damp woods.
Mexican Drop-seed Grass	Muhlenbergia Mexicana, Trin	Low grounds.
Drop-seed. Nimble Will	Muhlenbergia diffusa, Schreber	Dry hills, woods.
Pennsylvania Blue Grass	Poa compressa, L	Pastures, meadows, dry grounds.
Lyme-Grass. Wild Rye	Elymus Virginicus, L	River banks, fence rows.
Bottle-Brush Grass	Gymnostichum hystrix, Schreb	Woodlands.
Wild Oat Grass. Poverty Grass	Danthonia spicata, Beauv	Sterile soils.
Panic Grass	Panicum dichotomum, L	Dry grounds, low grounds.
Beard Grass	Andropogon furcatus, Muhl	Dry sterile soils.
Common Horse-tail	Equisetum arvense, L	Moist, sandy and gravelly soils.
Scouring Rush. Shave-Grass	Equisetum hymeale, L	Wet banks, pastures.
	Introduced Species.	
Larkspur	Delphinium consolida, L	Grain fields, waste places.
Common poppy	Papaver somniferum, L	Near dwellings.
True Water-Cress	Nasturtium officinale, R. Br	Brooks, ditches.
False Flax	Camelina sativa, Crantz	Flax-fields.
Wild Radish. Jointed Charlock	Raphanus Raphanistrum, L	Old fields.
Thyme-leaved Sandwort	Arenaria serpyllifolia, L	Sandy soil, waste places.
Yellow Melilot	Melilotus officinalis, Willd	Waste places.
Jerusalem Artichoke	Helenium tuberosus, L	Fence-rows.
Herba Impia	Filago Germanica, L	Dry places.
Common Pimpernel	Anagallis arvensis, L	Sandy soil, waste grounds.
Field Speedwell	Veronica agrestis, L	Sandy fields.
Peppermint	Mentha piperita, L	Low, wet grounds.
Common Hemp-Nettle	Galeopsis tetrahit, L	Waste places.
Common Comfrey	Symphytum officinale, L	Moist grounds.
Common Morning-Glory	Ipomœa purpurea, Lam	Cultivated fields.
Apple-of-Peru	Nicandra physaloides, Gærtn	Waste grounds.
Jerusalem Oak. Feathered Geranium	Chenopodium botrys, L	Waste places.
Mexican Tea	Chenopodium ambrosoides, L	Waste places.

CLASS III.—Continued.

Common name.	Scientific name.	Where found.
	Introduced Species.	
Amarantus	Amarantus hypochondriacus, L	About dwellings.
Prince's Feather	Polygonum Orientale, L	Gardens.
Bloody-veined Dock	Rumex sanguineus, L	Waste and cultivated grounds.
Cypress Spurge	Euphorbia cyparissias, L	Roadsides.
Hemp	Cannabis sativa, L	Waste and cultivated fields.
Asparagus	Asparagus officinalis, L	Fence-rows.
Field Garlic	Allium vineale, L	Wheat fields, moist meadows.
Pillous Eragrostis	Eragrostis pilosa, Beauv	Sandy or gravelly waste places.
Upright Chess	Bromus racemosus, L	Wheat fields, meadows.
Canary Grass	Phalaris Canariensis, L	Door-yards, road-sides.
Smooth Panic-Grass	Panicum glabrum, Gaudin	Cultivated and waste places.

REPORT ON ORNAMENTAL GARDENING.

The following condensed notes are the result of observations and tests made at the Station during the past two or three years. They are published in response to frequent letters of inquiry concerning the cultivation of flowers and the management of ornamental grounds.

WINDOW GARDENING

is the cultivation of plants for in-door use and home decoration. The essential requisite for success is to allow our plants all the needful *light*, *air* and *warmth* and protect them from the dry heat, injurious gases, etc., on one hand, and from undue cold on the other.

A *bow* or *bay window* with a southern or south-eastern exposure is most suitable for house plants.

GENERAL HINTS AS TO THE CORRECT MANAGEMENT OF HOUSE PLANTS.

I. If possible, get good, strong, healthy plants to start with.

II. Do not over-crowd your plants. Better keep a few well, than to have a larger number poorly cared for.

III. Give house plants as much light as possible during the day, and darkness with a lower temperature at night.

Plants require rest. A uniform temperature of 60° to 70° in the daytime and 40° to 45° at night will give the best results.

Turning plants towards the light, if done at all, should be done regularly.

IV. Besides light, house plants require a good supply of fresh air. Ventilation is absolutely necessary.

V. A proper amount of moisture is necessary for both roots and top.

A dry soil or a dry atmosphere is fatal. The object of watering is at least two-fold: (1) It supplies plant food, or elements of fertility contained in itself. (2) It converts the plant food, or nourishment of the soil, into a liquid form so that it may be absorbed by the roots.

The roots of plants should be kept *moist*, not wet.

Where the drainage is the most perfect plants will generally be the healthiest and will need watering the oftenest.

PRACTICAL HINTS FOR WATERING PLANTS.

Rain water is better than spring or well water. Hard water may be greatly improved by adding a drop or two of hartshorn or a little soda,—a small nugget about the size of a pea, to every gallon of water used.

Time.—Morning is best, next the evening. Never water house plants when the sun is shining brightly upon them.

The supply of water must be regulated according to the demands of the plant.

The condition of the plant and of the surface soil is the best guide.

Never give water when the soil is moist to the touch.

Nearly all plants require more water when in bloom than at any other time; they require more in a *warm* temperature than in a cold; more when in a state of active growth than when at rest.

Plants in open rooms usually require water once a day, and some that delight in moisture, need it twice.

All plants should be examined at least once a day, with intent to water, if that is necessary. Experience alone can determine the proper amount to give each plant.

Cleanliness.—The leaves of plants should be kept free from dust, hence frequent washings are absolutely essential.

Never wet the flowers of a plant nor allow drops of water to stand on the leaves in the sunshine.

Never allow water to stand in the saucers of the pots, unless the plants are semi-aquatic.

INSECT ENEMIES—HOW TO DESTROY THEM.

The Red Spider. It is only found where the air is dry, hot and close. Remedies—1. Correct the conditions that favor its development. 2. Syringe with a solution of whale oil soap; one-fourth pound soap to two gallons water. 3. Dust with finely ground red (Cayenne) pepper. 4. Boil one ounce of Quassia wood in three pints of water, until but a quart remains. When lukewarm apply to every leaf with a sponge or brush. Let the plant stand fifteen minutes then wash with pure water.

The Aphis or "*Green Fly*" Small green plant lice which multiply rapidly and injure plants by sucking their juices. Remedies—Sprinkling with tobacco water, or a solution of whale oil soap. Smoking with tobacco stems.

The Scale Insect. Remedy—Frequent washing with soap suds. Use a stiff brush.

Thrips. Remedy—Tobacco smoke.

HANGING BASKETS

form one of the simplest and cheapest styles of window gardening. They are usually round, and are made of wire, earthen-ware or rustic work, i. e., the rough and gnarled roots and branches of shrubs and trees.

The soil need in no way differ from that for plants growing in pots. It *may be less rich*, and for some plants *should be*, or they will outgrow their space.

Only certain kinds of plants are suitable for hanging baskets. They should be of low. compact growth, to cover the surface, or of a drooping or trailing habit to hang over the sides. The following are among the best:

I. *Low upright plants for center*—Coleus, Achyranthes, Geranium, Centaurea, Sedum, Primula, Cerastium, Pyrethrum.

II. *Drooping or trailing plants for edge*—Vinca (Common Periwinkle), Lobelia, Lysimachia (Moneywort), Tradescantia (Wandering Jew), Linaria (Coliseum Ivy), Maurandia, Saxifragas, Ice Plant, Solanum.

CLIMBING VINES.

The English Ivy (*Hedera helix*) is one of the most popular ornamental plants of the window garden. The ease of culture, its beautiful foliage, and evergreen character all combine to make it a favorite.

It requires a rich soil and a good supply of moisture. It is not very sensitive to changes of light and is well suited for hall-ways or rooms not well heated. Like other plants, however, it thrives best in a uniform temperature.

Perhaps the most successful use of the Ivy is in the hanging basket. It may also be used for decorating picture frames, etc.

The Irish Ivy (*Hedera Canariensis*) is slightly larger than the English. Its leaves are 5-lobed. It will thrive in a cool, shady and close room. Too great exposure to the heat of the sun will cause the leaves to turn purple.

German Ivy (*Senecio scandens*).—This grows much more rapidly than the *Hederas*. It has lighter green leaves, is entirely free from insects and very easy to propagate.

Linaria cymbalaria (*Coliseum* or *Kenilworth Ivy*).—Smaller, stems slender and purplish. Flowers small. It grows in cracks and crevices of old buildings. There are over 50 varieties of the above mentioned three kinds of Ivy.

(1). *Cobæa scandens* (*Polemonaceæ*) —Named in honor of Cobo, a Spanish priest who first described it. It is propagated either from seeds or cuttings. It requires a high degree of warmth, a light, rich soil and plenty of water.

(2). *The Passion Flower* (*Passiflora cærulea*) *Passifloraceæ*.—It thrives best in a light, fertile soil and requires plenty of sunlight. It is easily injured by over watering.

(3). *Morning Glory* (*Ipomœa*) $\left\{\begin{array}{l}\textit{Coccinea}\\ \textit{limbata}\\ \textit{hederacea}\end{array}\right\}$ *Convolvulaceæ*.

(4). *Smilax* (*Myrsiphyllum asparagoides*) *Liliaceæ*.—It is a bulb and requires a rich, sandy and rather moist soil to grow it to perfection. What are usually taken for *leaves of the Smilax* are simply metamorphosed branches.

(5). *Nasturtium* (*Tropæolum*) *Geraniaceæ*.—A large group of elegant growing, profuse blooming climbers. The four principal species are: Tropæolum major, Tropæolum minus, Tropæolum lobiannum, Tropæolum peregrinum, (Canary Bird Flower).

Each *species* is divided into a large number of *varieties*.

(6). *Maurandia*.—An elegant climbing perennial belonging to the order *Scrophulariaceæ*. Named in honor of Dr. Maurandy, the botanical professor at Carthagena. The most important species is *Maurandia Barclayana*.

(7). *Thunbergia*. —An ornamental climber belonging to the order *Acanthaceæ*. Dedicated to Thunberg, a great botanical traveler.

CLIMBING VINES FOR THE BALCONY OR PIAZZA.

There are few ornamental plants more desirable than our hardy perennial climbers. They are invaluable for covering porches, arbors, old stumps, trees, walls, rocks, etc.

The following list comprises those best adapted to this climate :

1. Virginia Creeper or Am. Ivy (*Ampelopsis*) (*Vitaceæ.*)
2. Wistaria (*Leguminosæ.*)
3. Honeysuckle (*Lonicera*) (*caprifoliaceæ.*)
4. The Trumpet Vine (*Bignonia.*)
5. The Trumpet Creeper (*Tecoma.*)
6. Dutchman's Pipe (*Aristolochia.*)
7. Clematis (*Renunculaceæ*)
8. Akebia, *Lardizabalaceæ*)

The Jasmine and climbing Roses might be added to this list. The above list of climbers are all hardy.

FLOWERING BULBS.

Botanically, a "*bulb*" is an enlarged underground stem, or a permanent bud with fleshy scales.

Though usually considered a root, it partakes more of the nature of a seed.

Structurally, *bulbs* are of three kinds:

1. The *coated* (Hyacinth) (Onion), etc.—Those which have wide scales folding around each other.
2. The *scaly* (Lily).—Which consist of narrow fleshy scales united at the base.
3. The *solid* (Gladiolus) (Crocus), etc.—Those consisting of a white solid farinaceous mass. *Popularly*, any solid, spherical, underground stem is called a "*bulb*."

Bulbs may be divided into *two* geographical classes, viz: (1). Holland Bulbs; (2). Cape Bulbs. The *first class* comprises the Hyacinth, Tulip, Crocus, Snowdrop, Gonquil, Narcissus, Iris and Fritallaria.

The *second class* comprises Gladiolus, Amaryllis, Agapanthus, Oxalis, Nerine, Ixias, Tigridia.

THE HYACINTH.

Selection of Bulbs.—They should be clean, nearly spherical, hard and heavy, with smooth skin, not appearing scaly.

Size is no criterion of quality.—Single varieties are usually best.

Caution.—Do not buy cheap or "mixed" bulbs, neither those that are very high-priced on account of scarcity. *Good bulbs* cannot be had at much less than three dollars per dozen.

Flowering Bulbs.—A list of those suited for the window garden.

1. Tulip (*Tulipa*) (*Liliaceæ*).—Asia. There are numerous varieties, both single and double. The single are the handsomer. They are divided into three classes, viz.:
    (a) *Bizzares.*—Ground color, yellow.
    (b) *Rose.*—Variegated with crisom, pink and scarlet.
    (c) *Byblomen.*—Marked with black, lilac, purple.
2. Narcissus.—A large genus of *Amaryllidaceæ.* The principal species are *N. pseudo*, *N. jonquilla*, *N. polyanthns.*
3. Crocus (*Iridaceæ*).—S. Europe.
4. Snowdrop (*Galanthns*) (*Amaryllidaceæ*).—Europe.
5. Iris (Flower de Luce) (*Iridaceæ*).—Species cultivated for orament mostly. From Europe.
6. Ranunculus and Anemone (*Ranunculaceæ*).
7. Cyclamen (*Primulaceæ*).—Europe.
8. Scilla (Squill) (*Liliaceæ*).—Europe.
9. Amaryllis (*Amaryllidaceæ*).—Africa.
10. Lily (*Lilium*) (*Liliaceæ*).—Asia.
11. Lilly of the Valley (*Conrallaria*) (*Liliaceæ*).—Am.
12. Agapanthus ((*Liliaceæ*).—S. Africa.
13. Tuberose (*Polyanthes*) (*Amaryllidaceæ*).—Africa.

The most important rule in *bulb-culture* is, grow the foliage well. The stronger and more vigorous the leaves, the stronger will be the bulb, and consequently the larger and finer the bloom.

Flowering bulbs are subject to few diseases, and insects seldom attack them.

A list comprising some of the least expensive and most easily managed plants for window culture:

Calla.
Cyclamen.
Chrysanthemums.
Chinese Primrose.
Fuchsia.
Hyacinth and other Bulbs.
Geraniums.
Heliotropes.
Pelargoniums.
Azaleas.

The above will grow freely and flower in a temperature of about 50 degrees at night, with 15 or 20 degrees higher during the day.

A list of plants somewhat more expensive, more difficult of cultivation and requiring a higher temper temperature:

Bourrardias.
Begonias.
Euphorbias.
Poinsettias.
Lycopodiums.
Tuberoses.
Stephanotis.
Orchids.
Ferns.

The above thrive best in a humid atmosphere. Temperature 60 degrees at night, with 15 or 20 degrees higher during the day.

OUT-DOOR FLOWER GARDENING.

I. *Extent and Condition of Grounds.*

Perhaps the greatest defect in American flower gardens is that they are too large, and not sufficiently cared for. No one should have more ground in an ornamental garden than he can keep in the very highest state of cultivation.

Excellence affords satisfaction and pleasure, while failure or a partial success is a source of mortification and pain.

THE LAWN.

Nothing adds more to the attractiveness of a home than a fine, well kept lawn, and the importance of "grasses" as agents of decoration and ornament can hardly be overrated.

Grass in the shape of a well kept lawn is one of the simplest and yet the loveliest element in every landscape scene.

The essential requisites for a perfect lawn may be divided into the four following heads:

1. *A deep, rich soil with a carefully prepared seed-bed.*
2. *A proper selection of grasses.*
3. *Thorough mulching of the ground after seeding.*
4. *Frequent watering and mowing; weeding when necessary.*

Good lawns are often spoiled by making unnecessary walks and drives, and by excessive planting of trees and shrubs. Grass will not grow thriftily in dense shade, and no lawn can look well cut up by numerous walks and drives.

Good lawn grasses must answer the following requirements:

1. *They should combine the finest possible leaf growth with a capability of renewal under constant cutting.*
2. *They should possess the power of intimate weaving one with the other so as to form a stiff sod.*
3. *The different varieties should grow with equal rapidity so as to preserve the same height.*
4. *They should occupy the ground so completely as to exclude all other plants.*

The seeding of a lawn should be done in early spring, the ground having been thoroughly prepared the previous autumn. After sowing the seed cover the surface an inch deep with fine stable manure. This is needed as shade and mulch.

If the work is well done, the lawn will look well by the last of June, and require cutting by that time. Some weeds will naturally appear. The annuals being frequently cut off cannot seed and will soon be killed. Perennials, like dock and plantain, should be removed by hand.

After experimenting with various mixtures of seed, we have found the following to give the most satisfactory results:

I. *Mixture for Fine Lawns Frequently Mown.*

June grass or Kentucky blue grass (*Poa pratensis*)	10 pounds.
Red-top (*Agrostis vulgaris*)	10 "
Perennial rye grass (*Lolium perenne*)	10 "
Rough meadow grass (*Poa trivialis*)	5 "
Timothy (*Phleum pratense*)	5 "
Sweet vernal grass (*Anthoxanthum odoràtum*)	5 "
White clover (*Trifolium repens*)	5 "

The above mixture will be sufficient to seed an acre. If less ground is to be sown, use the seed in proportion.

It is frequently desirable to keep larger areas of land in the immediate vicinity of the house in the form of *lawn meadows*. Such grounds may be kept in fine order by mowing them several times during the season, and still yield good crops of hay. The following mixture of seed will prove satisfactory for such places:

II. *Mixture for Permanent Lawn Meadow.*

June grass or Kentucky blue grass (*Poa pratensis*)	10 pounds.
Red top (*Agrostis vulgaris*)	10 "
Timothy (*Phleum pratense*)	5 "
Perennial rye grass (*Lolium perenne*)	5 "
Rough meadow grass (*Poa trivialis*)	5 "
Red clover (*Trifolium pratense*)	5 "
White clover (*Trifolium repens*)	5 "

The above notes regarding the lawn are copied from the third annual Station report.

SELECTION OF FLOWER SEED.

Make out your order *early*, and be careful to have it full and clear. *Send to none but reliable seedsmen.*

As a rule, sow only fresh seed. Don't order more than you use each year.

If unacquainted with the best seedsmen, it is a good plan to order from several. Give the seeds a fair, impartial trial, and note results.

DESIGNS FOR FLOWER BEDS.

There are *four* well defined systems of planting flower gardens, viz.:

1. *Promiscuous or mixed.*
2. *Massing.*
3. *Ribbon style.*
4. *Carpet style.*

The first has many advocates but seems to be rapidly disappearing. When adopted care should be taken to so arrange the plants that the tallest shall be at the back of the bed, if this is against the fence, wall, or back ground of shrubbery. In open beds on the lawn, the tallest should be in the center, the others grading down to the front on all sides.

The following dwarf plants are suitable for edgings or borders: Alternanthera, Armeria or Thrift, Pyrethrum aureum.

White-leaved plants—Glaucium, Centaurea, Cineraria maritima.

Massing is the planting of a single variety either in large or small beds.

The following named plants are suited for planting in "masses" or "ribbon" lines. They are named as nearly as possible in the order of their height, number one in each case being the tallest.

The outline of a "ribbon bed" should form a regular slope from the centre or highest point, down to the front or lowest point.

List, No. 1—

1. Canna Indica zebrina.
2. Salvia splendens.
3. Coleus (Golden Bedder).
4. Coleus (Hero).
5. Centaurea candida (Dusty Miller).
6. Alternanthera lalifolia.

List, No. 2—

1. Caladium esculentum.
2. Coleus verschaffeltii.
3. Delphinuim bicolor (Larkspur).
4. Cyperus alternifolius.
5. Achyranthes verschaffeltii.
6. Geranium (Mountain of Snow).

List, No. 3—

1. Ricinus or Canna.
2. General Grant Geranium.
3. Centaurea candida.
4. Golden Pyrethrum.

List No. 1 and 2 are suitable for beds having a diameter of 10 feet and upwards. No. 3 is suitable for a bed from 5 to 12 feet in diameter.

The Carpet Style.—A great variety of succulent plants are used, such as Echereria, Sedums, Sempervivums, Mesembryanthemums, etc., etc., together with numerous low growing Alpine plants, such Ajagas, Cerastiums, Lysimachias, Lobelias, Alternantheras, etc., etc.

Not a leaf of these plants are allowed to grow more than six inches above the lawn. Planting in this style admits of almost unlimited variety in the form of the beds, and contrasts of colors. Strips of colored paper giving the exact tints of the leading flowers and foliage are very useful in arranging designs for "ribbon" or "carpet" planting.

CLASSIFICATION OF FLOWERING PLANTS.

The plants of the out door flower garden, besides shrubs, trees, etc., may be divided into *Annuals*, *Biennials*, *Herbaceous Perennials* and *Bulbous.*

Annuals flower the first season, perfect their seed and then die. Many varieties grown as Annuals in a northern climate are either Biennials or Perennials in their southern home.

Annuals flower in a few weeks or months after the seeds are sown and usually make a brilliant show. In our climate Annuals may be classed as *Hardy*, *Half Hardy* and *Tender.*

Hardy Annuals, like Petunias, Candytuft, etc., may be sown in the open ground in autumn or very early in the spring.

The Half Hardy are those like the Balsam, Marigold, etc., which cannot be sown in the open ground until all danger from frost is over.

Tender Annuals must be started in a green-house or hot-bed to bring them to perfection and should not be transplanted to the open ground until the weather is quite warm. The Cypress Vine (*Ipomœa*) and Sensitive Plant (*Mimosa*) are good examples.

Biennials are those that flower the second season after the seed is sown and then die, unless special care be taken to preserve them.

Herbaceous Perennials are plants which die down to the ground every autumn, but the roots continue to live and new branches and *flower stems are thrown up for many years.*

Bulbous Plants are divided into *Hardy* and *Tender.* The former includes all that will bear a northern winter. The latter are those that will not bear freezing and must be planted in spring.

LIST OF ANNUAL FLOWERING PLANTS,

comprising generally well known and favorite kinds, such as are of easiest cultivation, and are most valued for the beauty and fragrance of their flowers:

Asters.
Balsams.
Candytuft.
Cannas.
*Canary Bird Flower.
Clarkias.
Cockscombs.
Collinsia.
*Convolvulus.
*Cypress Vine.
Delphiniums.
Dianthus.
Escholtzia.
Globe Amaranths.
Ice Plant.
*Ipomœa.
Lobelia.
Lupines.
Lychnis.
Marigolds.
Mignonette.
Mimosa.
*Nasturtium.
Pansy.
Petunia.
Phlox Drummondii.
Poppy.
Portulaca.
Scabiosa.
Schizanthus.
Sweet Peas.
Stocks.
Zinnias.

Those marked * are Climbers.

In the above list the popular and scientific names are used indiscriminately, just as they are found in most florists' catalogues.

Purchase few "novelties" until you know their merits have been tested.

LIST OF HARDY HERBACEOUS PERENNIALS.

Aconitum (Monkshood).
Aquilegia (Columbine).
Asperula (Spireæ?).
Campanula (Harebell).
Clematis (Clematis).
Colchicum (Saffron).
Convallaria (Lily of the Valley).
Delphinium (Larkspur).
Dicentra (Bleeding Heart).
Dictamus (Fraxinella).
Funkia (Day Lily).
Helleborus (Chris. Rose).
Iberis (Candytuft).
Iris (Flower de Luce).
Liatris (Blazing Star).
Lilium (Lily).
Linum (Per. Flax).
Lobelia (Card. Flower).
Lupinus (Lupine).
Lychnis (Lychnis).
Mertensia (Lungwort).
Myosotis (Forget-me-not).
Narcissus { Jonquil.
Daffodil.
Œnothera (Eve. Primrose).
Pæonia (Pæony).
Papaver (Poppy).
Pentstemon (Penstemon).
Phlox { Moss Pink.
French Lilac.
Polemonium (Jacob's Ladder).
Primula (English Cowslip).
Pyrethrum (Pyrethrum).
Saxifraga (Saxifrage).
Sedum (Stone Crop).
Sempervivum (House Leek.
Spiræa (Spiræa).
Symphytum (Comfrey).
Thalictrum (Meadow Rue).
Yucca (Bear Grass).

Bedding Plants is a general term given to herbaceous plants which are winter inhabitants of the green house or window garden, but which if planted out in the open ground during late spring or early summer bloom profusely until the approach of frost in the autumn. As a rule, they are perennials, but among them are many plants which bloom late in the summer, from seed sown in the open ground the previous spring. There is a long list of these plants. Among the most important are: Verbenas, Geraniums, Chrysanthemums, Coleus, Centaurea, Achyranthus, Caladiums, Cannas, Ricinus, Dahlias, Pyrethrum, or Feverfew, Alternanthera.

THE ROSE.

Garden Classification.—Roses may be divided into three general classes:

1. *Those that bloom only once in the season.* This class includes the French, Hybrid China, Provence, Sweet Brier, Moss, Scotch and all the *climbing* varieties that are hardy in this latitude.

2. *Those that make distinct and separate periods of bloom.* This class is called Damask, Hybrid Perpetuals, or Remontants.

It is probably the most interesting class of Roses, embracing many hundred varieties, most of which are hardy, although some require winter protection.

3. *Those that bloom continually without any temporary cessation,* hence called Monthly or Ever-blooming Roses.

This class comprises at least four well marked sub-classes, viz.: Tea, Noisette, Bourbon and Bengal.

All of the third class are tender and unless well protected are either killed outright or cut down to the roots by the frost in winter.

Tea Roses are of slender growth and tea-scented.

Noisettes are rampant growers and flower in clusters.

Bourbon varieties are characterized by their large and double flowers.

Bengal by the absence of all orange or yellow shade of color.

ROSE CULTURE.

Location.—Select the best place in the flower garden—one that is or may be protected from bleak, sweeping winds. A warm, sunny position is also requisite.

Soil.—Roses will do well in any ordinary garden soil well drained and free from stagnant water.

Fertilizers.—These must be applied generously if we expect a generous yield of flowers. Stable manure, bone dust, soot and guano are all valuable.

Pruning should be done in November or March.

Protection.—*Mulching* is necessary to prevent injury from drouth and from frost. *Pegging down* is necessary to prevent certain varieties from winter-killing.

The following are the essential requisites of a perfect Rose:

1.	Beauty of color	6 points.
2.	Beauty of form	5 "
3.	Fragrance	4 "
4.	Profusion and continuity of bloom	3 "
5.	Vigor and healthfulness of growth	2 "
	Total	20 points.

ORNAMENTAL SHRUBS.

Grounds are seldom so small that a few choice shrubs cannot appropriately find room, while for larger places they are indispensable to its proper ornamentation.

The following list embraces some of the leading kinds. For the others reference may be made to the catalogues of the principal nurseries:

Amygdalus nana,	Flowering Almond.
Berberis vulgaris, (Var.)	Purple Barberry.
Calycanthus Floridus,	Sweet Scented Shrub.
Chionanthus Virginica,	Fringe Tree.
Deutzia, (Varieties)	Deutzia.
Euonymus atropurpureus,	Burning Bush.
Forsythia viridissima,	Golden Bell.
Hibiscus syriacus,	Rose of Sharon.
Hydrangea, (Vars.)	Hydrangea.
Lonicera,	Tartarian Honeysuckle.
Magnolia, (Vars.)	Magnolia.
Philadelphus, (Vars.)	Mock Orange.
Ribes aureum,	Missouri Currant.
Syringa, (Vars.)	Lilacs.
Spiræa, (Vars.)	Spiræas.
Viburnum, (Vars.)	Snowball.
Weigela, (Vars.)	Bush Honeysuckle.
Azalea Pontica,	Belgian Azalea.
Cercis Japonica,	Japan Judas Tree.
Pyrus Japonica,	Japan Quince.
Prunus triloba,	Flowering Plum.
Symphoricarpus.	Snowberry.
Cystius elongatus,	Laburnum.

HARDY EVERGREEN SHRUBS.

Andromeda floribunda,	Andromeda.
Buxus sempervirens arborea,	Tree Box.
Biota orientalis,	Eastern Arbor Vitæ.
Daphne Cneorum,	Garland Flower.
Ilex opaca,	American Holly.
Juniperus, (Varieties)	Juniper.
Kalmia latifolia,	American Laurel.
Podocarpus Japonica,	Japan Yew.
Retinospora obtusa,	Obtuse leaved Retinospora.
Retinospora plumosa aurea,	Golden-plumed Retinospora.
Rhododendron catawbiense, (hybrids)	Rhododendron.
Taxus baccata, var. Canadensis,	American Yew.
Taxus baccata erecta,	Upright Yew.
Thuga, (Varieties)	American Arbor Vitæ.

HARDY EVERGREEN TREES OF MEDIUM SIZE.

Abies Canadensis,	Hemlock Spruce.
Abies excelsa,	Norway Spruce.
Abies excelsa Gregoryana,	Gregory's Spruce.
Abies excelsa pygmæa,	Dwarf Spruce.
Abies excelsa inverta,	Inverted Spruce.
Abies nigra pumila,	Dwarf Black Spruce.
Abies Fraseri, var. Hudsonica,	Hudson's Bay Fir.
Abies pectinata,	European Silver Fir.
Abies Pichta,	Siberian Silver Fir.
Juniperus Virginiana,	Red Cedar.

Pinus strobus,	White Pine.
Pinus cembra,	Swiss Stone Pine.
Pinus pumilio,	Dwarf Pine.
Pinus Austriaca,	Austrian Pine.

For screens and wind-breaks there is nothing equal to the *Austrian Pine and Norway Spruce.*

For a low hedge or border the *Hemlock Spruce*, *American Arbor Vitæ* and *Norway Spruce* are best.

VASES, ROCK-WORK, ETC.

Nothing is more effective as an adornment of the lawn or flower-garden than a *well kept vase.* Most of the vigorous growing ornamental leaved plants are appropriate for the top or center of the vase.

Plants of a lower or drooping habit should be placed near the edges.

The Verbena and Petunia are among the best plants for this purpose.

As every side of a vase is exposed to air and sun the evaporation is very great, and they must receive an abundance of water in order to keep the plants in good condition.

ROCKERY.

This is usually constructed of rough stones, tastefully arranged with soil sufficient for the growth of plants suitable for such a place.

"Artificial rock-work" can be made by collecting the clinkers from furnaces, and dipping them in a hot-lime wash which gives a coloring of pure white. Upon this plants with bright colors are the most suitable, such as Verbenas, Coleus, Scarlet Geraniums, Lobelias, Lysimachia, etc.

Rockwork may often be used to advantage in forming screens.

Grounds where rocks exist in their natural condition can be made very ornamental by setting out plants of a drooping, trailing or climbing habit.

Those best suited for this purpose are:

Achilleas.
Campanulas.
Cerastium.
Linnæa.
Lychnis.
Lysimachia.
Phloxes.
Orobus.
Polemonium.
Saxifragas.
Sedums.
Sempervivums.
Soldanella.
Vinca.
Thymus.
Violas.

FLORAL DECORATIONS.

The art of arranging flowers gracefully is not so easily taught as their culture, for it requires an artistic eye to group them tastefully.

Placing flowers loosely and naturally in vases and other ornamental receptacles is a simple matter, requiring only good taste and some knowledge of the harmony of colors.

Many a vase or bouquet of flowers is ruined by mingling too many kinds and too great a variety of colors. Two or three purple flowers in a vase of scarlet and white will destroy the whole effect.

Preservation of Cut Flowers.—Hot water will frequently restore flowers to freshness, even when every petal is drooping. Place the stems into a cup of boiling hot water and leave them until the petals become smooth. Then cut off the cooked ends and put into luke-warm water.

A Wardian case or a cool room is best adapted to keeping flowers fresh. They will wilt quickly in badly ventilated rooms, especially if filled with tobacco smoke. Take away each flower as it fades, else it will cause the others to decay.

It is far better to gather a large portion of your flowers for yourself and friends than to allow them to fade on the plants.

SUMMING UP.

The cultivation of flowers is an occupation that improves alike the body, mind and heart. It is an almost certain indication of purity and refinement.

To become skillful in the art requires study, observation and experience. It is not a rude, simple matter, but requires and rewards the fullest command of science and the amplest knowledge of Nature's laws.

The difficulties of floriculture only enhance its pleasures, for whatever is worth having is worth working for.

Blight, drouth, frost, mildew, hail, flood, insects may make, for a time, your flowering plants a sorrow and a vexation; but those who love them will persevere through every discouragement and triumph over every obstacle—rejoicing all the more because their flowers are the reward of honest, faithful, persistent work.

What we need in floriculture is more study, more thought, more enthusiasm, with less blind devotion to old ways, methods and practices, which, if ever desirable and judicious, have long ceased to be so. If those who love floriculture will intelligently resolve that it shall and must improve, it will not be long till we have an art worthy of our country and worthy of the age in which we live.

REPORT ON GRASSES.

MEADOW FOX-TAIL (*Alopecurus pratensis*).

This grass has been growing in our experiment plots since the spring of 1883. It has stood the winter remarkably well, making a rapid growth in early spring before other varieties have scarcely started. In general appearance it resembles Timothy, but is much earlier and not nearly so large when mature. It promises to be a valuable early pasture grass and may also show considerable value for hay. We intend sowing it in a plot large enough to test its value in a practical manner. Height about 40 inches. In bloom May 10, 1884 and May 20 in 1885, the severe winter making it somewhat later in starting the latter year. Ripe June 2 and 10 for the two years respectively.

TIMOTHY (*Phleum pratense*).

This species is so well known that special notes are unnecessary. It forms the bulk of the cultivated grass over a large part of our country. Blooms here June 20 to 30. Varies from three to four feet in height. The variety mentioned before this is much more valuable, both for early and for late pasture.

RED TOP (*Agrostis vulgaris*).

Extensively cultivated as a pasture grass, not much esteemed for hay, but is of fair quality when cut before the seed hardens. Is quite hardy and stands pasturage well. Two and one-half to 3 feet tall here It blooms about June 20. Not equal to Blue Grass. Appears to flourish best on low, moist soil.

CREEPING BENT (*Agrostis stolonifera*).

Closely related to the previous species, but of smaller growth. After a fair trial we regard it as practically valueless as an agricultural grass in central Ohio where so many better kinds will do well. About 12 inches high. Blooms about June 25.

BROWN BENT (*Agrostis canina*).

Resembles previous species, except in stronger growing. Of some value as a pasture grass, but scarcely worthy the attention of the farmers of Ohio. It ranges from 15 to 18 inches tall. Blooms about June 20.

ORCHARD GRASS (*Dactylis glomerata*).

This is doubtless one of the oldest and most widely cultivated of grasses, yet it is a stranger on a great majority of the farms of Ohio. In the last few years it has been introduced in several localities in the State. Either from lack of proper attention to its habits of growth or from a disposition to regard with disfavor innovations in the nature of new grasses, it has not become as popular as it deserves. It has a peculiar habit of growing in decidedly prominent tufts or bunches, and when sown alone much of the land is likely to be unoccupied. Unlike timothy, our standard meadow grass, it *must be cut* before the seed hardens or its value for hay is very much impaired. Sown with common red clover it makes an excellent meadow, and they both come to the proper degree of maturity for cutting at the same time, or nearly so, which is immediately after full bloom. It can also be sown with red top or some other grasses with good results, but for a hay crop we much prefer it with clover. This grass starts early in the spring, but little later than meadow fox-tail, and makes a good pasture if sown in mixture so as to secure a good sod. Its aftermath is excellent, much better than timothy, there being a strong growth of heavy radicle leaves. It will doubtless grow better in the shade than any other cultivated grass, except rough-stalked meadow grass (*Poa trivialis*). It can be mowed twice for hay in this latitude, but the best results are secured by pasturing it moderately after the first cutting. It grows from 3 to 3½ feet high. Comes into bloom June 2. Ready for haying June 12. This grass was slightly injured by the past very severe winter.

BLUE GRASS (*Poa pratensis*).

June Grass, Kentucky Blue Grass, Spear Grass. This is a well known grass to which is applied different names in different localities and of which there are several varieties. It is the most important of our pasture grasses and has considerable value for hay, if cut in proper season. Its place, however, is decidedly in the pasture. It is regarded as quite a pest among cultivated crops in some sections of the State. It is thoroughly hardy and also withstands drouth better than most grasses. Its habit of spreading by rhizomas or root stalks enables it to encroach upon other cultivated grasses, as timothy, and finally entirely supersede them. It grows from 24 to 30 inches tall. Blooms about June 1.

FOWL MEADOW (*Poa serotina*).

Is quite common in the northern States, but has little agricultural value alone. Associated with other grasses in pastures it adds to the density of the sward. It makes good hay, but from our experience its yield would not be sufficient to warrant its cultivation for a hay crop. Does well in moist ground. It is 2½ to 3 feet tall. Blooms the last of June.

ROUGH-STALKED MEADOW (*Poa trivialis*).

This species resembles *Poa pratensis*, except that it has fibrous roots and has not the root stalk of the latter. There are some other points of difference by which it can be readily distinguished. Its chief value is for shaded lawns and pastures, especially in low situations. It has never been cultivated alone to any extent. It doubtless is a valuable variety to mix with others for sowing pastures. With us it has been hardy, making a very fair growth. It ranges from 2 to 2½ feet high. In full bloom from June 5 to 10.

WOODS GRASS (*Poa alsodes*).

Not much is said of this grass by agricultural writers. It is found on mountain sides and is said to grow well in cool, shaded places. Here, at the Station, it made a very unsatisfactory growth. It attained a height of 20 inches. Appears to have little, if any, value. Is probably of some importance for woodland pastures. Ripened here about June 15 to 20.

MEADOW FESCUE (*Festuca elatior*).

A very common meadow grass of Europe, and now being introduced into the meadows of this country. We believe from our experience with it for the past three years that it is a very promising meadow grass. The Station confidently recommends it as worthy of trial. It seems perfectly hardy, produces an abundant crop, and its after math is good.

In the South it is sometimes called "evergreen grass," and seems to be growing in general favor. At the Station it covered the ground quite well. Grows from 3 to 3½ feet tall. Blooms June 15 to 18.

Meadow Fescue is sometimes called English blue grass.

RESCUE GRASS (*Bromus unoloides*).

This species is not much known as a meadow grass, being cultivated only sparingly and mainly at the South. This is on account of its supposed inability to withstand low temperatures. It was all killed, but a few spears, at the Station the first winter, 1883, but the next year it stood quite well and this last season had thickened up so as to make a strong, vigorous plot. It made a very rank growth during the last spring and produced a very large amount of foliage.

The Station is quite interested in it, and if it continues hardy it will be given a more extended trial. It grows from 3 to 3½ feet tall. Blooms about June 20.

This species belongs to the same genera as chess or cheat.

RYE GRASS (*Lolium perenne*).

There are several species of the ray or rye grass of which *Lolium Italicum*, Italian rye grass, is the most important. The *Loliums*, and especially the one last named, are very popular in England, perhaps as much as timothy is here. In England it is a perennial, and a valuable hardy grass. At the Station it has never withstood our winters so that we could tell much about its value. It has been repeatedly sown, and has made excellent growth during the summer, but when it stands alone is entirely too tender for our severe winters. A variety called Pacey's rye grass is one of the most promising.

TALL OAT GRASS (*Arrhenatherum avenaceum*).

But little is said of this grass by agricultural writers of this country. It is mentioned as promising in some sections of the South. In Europe it is regarded as quite an important member of the grass family. It has been perfectly hardy at the Station where it has been growing for the past three years. It makes an abundant, early growth, and it apparently well adapted to grazing.

The Station recommends it as well worthy of trial. The coming season it will be sown in larger plots in order more fully to test its merits. It grows from three to four feet tall. Blooms here June 1 to 10. Ripens it seed about the 20th.

JOHNSON'S GRASS (*Sorghum halapense*).

This species has been known under several names, as Cuba grass, Mean's grass, Evergreen Millet, etc. . It belongs to the same genus as sorghum sugar cane (*Sorghum vulgare*). It has been cultivated for a long time in several localities in the South, and has been received generally with favor. Some complain of its persistency, it being quite difficult to eradicate when once thoroughly established.

This grass has received considerable attention of late in the agricultural press.

The Station has not tested it long enough to speak confidently in regard to its hardiness. So far as tried it does not appear able to stand the Northern winters.

From our tests it seems to be decidedly inferior to common millet as a forage plant. It grows here 4 to 4½ feet tall. Ripens about the 1st of August.

For two years past the Station has tested on small plots upward of one hundred distinct species and varieties of grass. Only a few of these have proved to be of sufficient value, in this soil and climate, to merit any further trial. Some appear to have unquestioned merit, and all such will be tested further before any report is made.

The list of varieties has been largely increased the present spring through the courtesy of the United States Department of Agriculture.

It is the hope and expectation of the Station that among the numerous varieties now on trial some may be found of great and permanent value. Among those which seem to promise the most is the Texas Blue Grass (*Poa arachnifera*). This species is a native of Arkansas, and appears to have great prospective value as a grass for winter grazing.

BOTANICAL NOTES.

A series of interesting botanical notes regarding the time of blooming, rapidity of growth, size, etc., of different plants have been collected by the different officers of the Station during the past year. Lack of space forbids the publication of these in the present report. Some of the more important of these notes will be published in the form of a bulletin at an early day.

PLANTS IDENTIFIED.

There appears to be a growing interest throughout the State in the subject of practical botany. The number of specimens of plants sent to the Station for identification and history, and the number of inquiries concerning plants of various kinds, have greatly increased the past season.

The number of specimens received during 1885, is more than double the whole number received the three years preceding.

The total number of plants examined and identified was 275, embracing 184 distinct species, and 45 different families or orders. These plants have come from all parts of Ohio, and from six other States.

Since the organization of the Station, specimens for identification have been received from twenty-two different States and Territories, also from Manitoba and Ontario, Canada. The larger share of the inquiries were concerning weeds, next, grasses and forage plants. Honey-producing plants, poisonous plants, medicinal plants, etc., were also subjects of inquiry.

The following list includes those that were examined and reported upon the past year. This part of the Station work was performed almost wholly by the Botanist, Mr. W. S. Devol:

LIST OF PLANTS—IDENTIFIED.

Botanical Name.	Common Name.
Clematis Virginiana, L	**Virgins Bower.**
Ranunculus acris, L.	**Buttercups. Tall Crowfoot.**
Anemone Virginiana, L	**Virginian Anemone.**
Argemone Mexicana, L	**Mexican Prickly Poppy.**
Viola cucullata, Ait	**Common Blue Violet.**
Cardamine rhomboidea, D. C., var. purpurea, Torr	**Bitter Cress.**
Capsella Bursa-pastoris, Moench	**Shepherd's Purse.**
Lepidium Virginicum, L	**Tongue Grass. Pepper Grass.**
Camelina sativa, Crautz	—
Hypericum perforatum, L	**Common St. John's Wort.**
Stellaria media, Smith	**Common Chickweed.**
Cerastium oblongifolium, Torr	**Mouse-ear Chickweed.**
Mollugo verticillata, L	**Carpet Weed.**
Malva rotundifolia, L	**Low Mallow. Cheeses. Round-leaved M.**
Abutilon avicennæ, Gærtn	**Velvet Weed. Indian Mallow, etc.**
Sida spinosa, L.	**Spiny Sida.**
Rhus toxicodendron, L	**Poison Ivy. Poison Oak.**

Ceanothus Americanus, L	Jersey Tea. Red Root.
Trifolium avense, L	Rabbit-foot. Stone Clover.
Trifolium pratense, L	Red Clover.
Trifolium stoloniferum, Muhl	Running Buffalo Clover.
Trifolium procumbens, L	Low Hop Clover.
Medicago lupulina, L	Black Medick. Nonesuch.
Desmodium paniculatum, D.C	Bush Trefoil. Tick Trefoil.
Lespideza repens, Torr. & Gray	Creeping Bush Clover.
Cassia Marilandica, L	Wild Senna.
Cæsalpinia Bonduc, Benth. & Hook	"Ponceanna."
Cæsalpinia Gillierii	Cæsalpinia.
Agrimonia parviflora, Ait	Small-flowered Agrimony.
Argemonia eupatoria, L	Common Agrimony.
Geum album, Gmelin	Avens.
Potentilla Canadensis, L	Five-Finger. Common Cingue-foil.
Potentilla Norvegica, L	Cinque-foil.
Potentilla arguta, Pursh	Cinque-foil.
Rosa Carolina, L	Swamp-Rose.
Henchera Americana, L	Common Alum-root.
Penthorum sedvides, L	Ditch Stone-crop.
Circæa Lutetiana, L	Enchanter's Nightshade.
Epilobium coloratum, Muhl	Willow-herb.
Œnothera biennis, L	Evening Primrose. Yellow Primrose.
Nesæa verticillata, H. B. K	Swamp Loosestrife.
Cuphea viscosissima, Jack	Cuphea.
Sanicula Marylandica, L	Senicle. Black Snake-root.
Daucus carota, L	Wild Carrot.
Archangelica hirsuta, Torr. & Gray	Hairy Archangelica.
Cryptotænia Canadensis, D.C	Honewort.
Erigenia bulbosa, Nutt	Harbinger-of-Spring.
Lonicera ciliata, Muhl	Fly Honeysuckle.
Triosteum perfoliatum, L	Fever-wort. Horse Gentian.
Galium trifidum, L	Small Bedstraw.
Galium triflorum, Michx	Three-flowered Bedstraw.
Cephelanthus occidentalis, L	Button-bush.
Dipsacus sylvestris, Mill	Wild Teasel.
Vernonia Noveboracensis, Willd	Iron Weed.
Eupatorium perfoliatum, L	Boneset. Thoroughwort.
Eupatorium ageratoides, L	Wite Snakewort.
Aster cordifolius, L	Heart-leaved Aster.
Aster ericoides, L	Small-leaved Aster.
Aster ericoides, L., var. villosus, Gray	Soft-hairy Aster.
Aster miser, L	Starved Aster.
Aster cerueus, Nee	Pale Aster.
Aster puniceus, L	Bright Aster.
Aster prenanthoides, Muhl	Prenanth-like Aster.
Aster Novæ-Angliæ, L	New England Aster.
Erigeron Canadense, L	Horse-weed. Butter-weed.
Erigeron annuum, Pers	Daisy Fleabane. White-weed.
Erigeron strigosum, Muhl	Daisy Fleabane.
Solidago Canadensis, L	Golden-rod.
Solidago gigantea, Ait	Great Golden-rod.
Solidago lanceolata, Ait	Lance-leaved Golden-rod.
Polymnia Canadensis, L., var. discoides, Gray	Leaf-cap.
Xanthium strumarium, L	Common Cockle-bur.
Heliopsis lævis, Pers	Ox-eye.
Heliopsis lævis, Pers., var. scabra, Gray	Rough Ox-eye.

Rudbeckia laciniata, L	Cone-flower.
Rudbeckia hirta, L	Yellow Daisy. Rough Rudbeckia.
Actinomeris squarrosa, Nutt	Actinomeris.
Bidens bipinnata, L	Spanish Needles.
Achillea millefolium, L	Common Yarrow. Mil-foil.
Chrysanthemum leucanthemum, L	Ox-eye Daisy.
Gnaphalium polycephalum, Mich	Common Everlasting.
Antennaria plantaginifolia, Hook	Plantain-leaved Everlasting.
Cirsium lanceolatum, Scop	Common Thistle. Horse Thistle.
Circium discolor, Spreng	Plumed Thistle.
Cirsium arvense, Scop	Canada Thistle. Cursed Thistle.
Nabalus Fraseri, DC	Lion's-foot. Gall-of-the-Earth.
Nabalus crepidineus, DC	Rattlesnake-root.
Lactuca Canadensis, L	Wild Lettuce.
Mulgedium leucophæum, DC	False Wild Lettuce.
Sonchus asper, Vill	Spiny-leaved Sow-Thistle.
Chamalatia foliolosa	Chamalatia.

Lobelia syphalitica, L	Great Lobelia.
Lobelia, ——	Lobelia.
Campanula Americana, L	Tall Bellflower.

Plantago major, L	Common Plantain.
Plantago lanceolata, L	Ribgrass. Buck Plantain. English Plantain.
Plantago aristata, Michx	Bearded Plantain.

Lysimachia quadrifolia, L	Four-leaved Loosestrife.
Lysimachia ciliata, L	Loosestrife.
Lysimachia lanceolata, Walt	Lance leaved Loosestrife.

Tecoma radicans, Juss	Trumpet Creeper.

Epiphegus Virginiana, Bart	Beech-drops.

Linaria vulgaris, Mill	Toad-flax. Butter-and eggs.
Scrophularia nodosa, L	Figwort.
Veronica peregrina, L	Neckweed. Purslane Speedwell.
Gerardia, ——	Gerardia.
Pedicularis lanceolata, Michx	Lousewort.

Teucrium Canadense, L	American Germander.
Lycopus Europæus, L	Water Horehound.
Lycopus Europæus, L., var. integrifolius, Gray	Water Horehound.
Lopanthus nepetoides, Benth	Giant Hysop.
Brunella vulgaris, L	Common Self-heal. Blue Curls.
Scutellaria lateriflora, L	Mad-dog Skull-cap.
Stachys palustris, L., var. asper, Gray	Hedge-nettle.
Leonurus cardiaca, L	Common Motherwort.

Verbena hastata, L	Blue Vervain.
Verbena urticifolia, L	Nettle-leaved Vervain. White Vervain.
Phyrma Leptostachya, L	Lopseed.

Lithospermum, ——	Puccoon. Stone-seed.
Lithospermum arvense, L	Wheat Thief. Pigeon-weed. Corn Grounwell.
Cynoglossum Morisoni, DC	Beggar's Lice. Stick-tight.

Phacelia Purshii, Buckley	Miami Mist.

Ipomœa pandurata, Meyer	Wild Potato-vine. Man-of-the-Earth.
Calystegia sepium, R. Br	Hedge Bind-weed. Rutland Beauty.
Cuscuta epilinum, Weihe	Flax Dodder.

Solanum Carolinense, L	Horse Nettle. Sand Brier.

Gentiana Andrewsii, Griseb	Closed Gentian.

Apocynum androsæmifolium, L	Spreading Dogbane.

Ligustrum vulgare, L.	Common Privit. Prim.

Chenipodium album, L.	Lamb's-quarters. Pig-weed.
Beta vulgaris, L., var. cicla, Wood	Chard. Scarcity.

Amarantus retroflexus, L	Pig-weed.
Amarantus albus, L	Green Amaranth.
Amarantus spinosus, L.	Thorny Amaranth.

Polygonum Virginianum, L.	Virginian Knot-weed.
Polygonum aviculare, L.	Knot-grass. Goose-grass.
Polygonum convolvulus, L	Black Bind-weed. Knot Bind-weed.
Polygonum dumetorum, L	Climbing False Buckwheat.
Rumex acetosella, L.	Field Sorrel. Sheep Sorrel. Sour-grass.

Euphorbia maculata, L.	Spotted Spurge.
Euphorbia hypercifolia. L	Hypericum-leaved Spurge.
Euphorbia cyparissias, L	Cypress Spurge.
Acalypha Virginica, L.	Three-seeded Mercury.

Smilax hispida, Muhl.	Cat-brier.

Junctus tenuis, Willd.	Slender Rush.

Cyperus phymatoides, Muhl	Galingale.
Cyperus strigosus, L	Nut-grass.
Scirpus divaricatus, Ell	Sprangly Bullrush.
Scirpus tentaculata,	Tentacled Bullrush.
Scirpus eriophorum, Michx	Wool-grass.
Carex Grayii, Carey	Gray's Sedge.

Agrostis vulgaris, With	Red-top. Herd's-grass.
Cinna arundinacea, L	Wood Reed-grass.
Muhlenbergia sobolifera, Trin	Drop-seed Grass.
Muhlenbergia Mexicana, Trin.	Mexican Wood-grass.
Muhlenbergia Willdenovii, Trin.	Wildenow's Wood-grass.
Muhlenbergia diffusa, Schreb	Drop-seed. Nimble Will.
Calamagrostis Canadensis, Beauv	Blue-joint-grass.
Oryzopsis melanocarpa, Muhl	Mountain Rice.
Stipa spartea, Trin.	Porcupine Grass.
Tricuspis sesleroides, Torr	False Red-top.
Dactylis glomerata, L	Orchard Grass.
Poa compressa L	Wire-grass. Pennsylvania Blue-grass.
Poa pratensis, L.	Blue-grass. June-grass.
Eragrostis poæoides, Beauv., var. megastachya, Gray	Eragrostis.
Festuca elatior, L.	Taller Fescue.
Festuca elatior, L., var. pratensis, Gray	Meadow Fescue.
Triticum repens, L	Couch-grass. Quitch-grass. Quack-grass.
Hordeum jubatum, L	Squirrel-tail Grass.
Danthonia spicata, Beauv.	Wild Oat-grass.
Phalaris arundinacea, L.	Reed Canary-grass.
Panicum sanguinale, L.	Common Crab-grass. Finger-grass.
Panicum latifolium, L.	Broad-leaved Panicum.
Panicum dichotomum, L.	Many-branched Panicum.
Panicum crus-galli, L	Barnyard-grass. Cockspur Grass.
Andropogon argenteums, Ell	Beard-grass.

Adriantum pedatum, L.	Maiden-hair Fern.
Asplenium Trichomanes, L.	Dwarf Spleenwort.
Asplenium thelypteroides, Michx	Silvery Spleenwort.
Aspidium cristatum, Swartz	Crested Shield-fern.
Aspidium marginale, Swartz	Marginal Fern.
Cystopteris, fragilis, Bernh	Fragile Bladder-fern.
Onoclea sensibilis. L	Sensitive Fern.

Ustilago segetum, Pers	Bird's-nest Fungus.

REPORT OF CHEMIST.

TESTING BUTTER.

Dr. Thomas Taylor, of the Agricultural Department, Washington, D.C., has issued in the form of an illustrated pamphlet an abstract from the proceedings of the American Association for the advancement of Science, of his method of examining butter and fats by means of the microscope and polarized light. According to this method butter yields peculiar globular crystals, with a characteristic black cross (St. Andrew's) when properly viewed with polarized light. They vary in size, color and other particulars, and are never seen in pure beef or lard fats. Since beef and lard fats are the chief substitutes for and adulterants of butter, any method by which they could be readily distinguished from each other and from butter would be a matter of the greatest importance. Hence Taylor's method, which purports to furnish a ready solution of this difficult problem, has received universal attention. The writer having received a number of samples of the premium butter exhibited at the last fat stock show at Chicago for examination, made a careful study of Taylor's method with a view of adopting it in his investigations in case it was found reliable and could be mastered.

MATERIAL.

1. Pure table butter, made at the University dairy.
2. Common lard, *i.e.*, lard from which none of the olein had been separated.
3. Pure "oleo oil."

This substance is prepared by rendering beef tallow at a temperature of 120° to 124° Fahrenheit, in jacketed caldrons heated by hot water or steam. The "oil" which separates is drawn off and kept at a temperature of about 85° Fahrenheit, until the greater part of the stearin and palmitin crystallizes out. The more readily fusible olein and margarine are obtained by submitting the mass just described to hydraulic pressure. The product thus obtained constitutes the "oleo oil" employed in adulterating butter, and corresponds almost precisely to the oleomargarine of the French chemist, Mege-Mouries.

4. Olive oil, salt and water.

APPLIANCES.

1. W. H. Bullock's biological stand, polarizing apparatus and No. 1 eyepiece.
2. Bausch and Lomb's three quarter inch objective, professional series.
3. Glass slides and covers, wooden pill boxes and toothpicks, test-tubes labels, etc

Experiment 1.—Of the butter described above about half an ounce was transferred to a test-tube fused in the flame of a Bunsen burner and gently boiled for one minute. It was then poured into a wooden pill box and allowed to stand until the next day. A small particle of the butter was then taken up on the point of a wooden toothpick and mixed on a glass slide with a drop of olive oil. The particle on being carefully stirred in the oil readily separated into globular masses visible to the naked eye, and after being covered with an ordinary covering glass and viewed with a pocket lens, presented the appearance of insect eggs, as described by Dr. Taylor. When viewed under the microscope with transmitted light, the magnified globules seemed to consist of a mass of crystalline matter. When viewed with polarized light many of the globules at certain positions of the polarizer revealed a well marked black cross. In some of the globules the cross was fainter and in others distorted, owing no doubt to accidental imperfections in the formation of the globules, or to injuries produced by mounting. When a selenite plate was inserted between the slide and polarizer the sections of the globule produced by the cross were alternately colored red and green.

When these globules are viewed by polarized light, with or without the selenite plate, the appearance which they present is so pronounced, that a person seeing them once would not fail to recognize them again.

Experiment 2.—A portion of ordinary lard was treated in the same manner as the butser in Experiment 1, except that it did not boil, owing to the absence of water. The cooled mass was examined the next day. The particle stirred up on a glass slide with a drop of olive oil separated with difficulty. When covered and viewed with a pocket lens only the most minute specks were visible. No globules as those obtained from butter in Experiment 1 could be seen. When placed under the microscope and viewed with polarized light, nothing but small irregular stellated bodies could be noticed, in which the cross was entirely wanting. A large number of slides were mounted and examined, but not a single "butter crystal" could be found.

Experiment 3.—In order to become acquainted with the behavior of the oleo oil under these conditions a portion of the same was treated as the butter and lard above. On account of its being free from water this substance, like the lard, did not boil on heating. The cooled mass was solid and white like a stearine candle, the yellow color of the oleo having been destroyed by the heating. It separated with difficulty when a small particle was stirred with olive oil on a glass slide. Neither the pocket lens nor the microscope with polarized light revealed any of the globular masses obtained from butter in Experiment 1, although a number of slides were mounted and carefully examined. Only small stellate crystals were present. Thus far the results and statements of Dr. Taylor were fully corroborated.

Experiment 4.—A mixture consisting of 90 per cent. butter and 10 per cent. oleo oil was boiled and cooled as before. The mounted slides could not be distinguished from the pure butter slides.

Experiment 5.—A mixture was next made of 75 per cent. butter and 25 per cent. oleo oil, and treated as before. Again no difference could be noticed between this adulterated butter and the pure butter. The "butter crystals" were large and perfect, the cross as distinct as in the pure butter, while the slide was remarkably free from any small crystals that might be taken for the adulteration.

Experiment 6.—Equal parts by whight of butter and oleo oil were next mixed together and subjected to the same treatment as above. The results, so far as a most careful examination could reveal, were essentially the same as in Experiment 5.

Assuming that the tallow fat, with which the pure butter was adulterated in the last three experiments, crystallizes out by itself in the form exhibited in Experiment 3, the writer is willing to concede that with only 10 per cent. of adulteration as in experiment 4, the tallow fat crystals might be overlooked. This oversight is much less probable in the next experiment with 25 per cent. of dulteration and is entirely out of the question, when, as in the last experiment, the adulteration amounts to 50 per cent. Hence, it is manifest that the tallow fats united with the butter fats in forming the globular masses.

Experiment 7.—The difference between the behavior of the tallow fats in Experiment 3, and the last three experiments, could only be ascribed to a difference of conditions. It is well known that table butter normally contains 4 to 6 per cent. of salt and 5 to 20 per cent. of water. These ingredients constitute the most marked difference between butter and the rendered animals fats as tallow and lard. In order to test the effect of this admixture upon the tallow fats, about half an ounce of the oleo oil used in Experiment 3 was mixed in a porcelain mortar with a small quantity of salt and eight or ten drops of water. After the water was thoroughly incorporated, the mass was transferred to a test tube and boiled for one minute as in the case of butter It was then poured into a wooden pill box and allowed to cool as before. The cooled mass presented quite a marked difference in appearance from that obtained from the same substance in Experiment 3. It retained to a great extent the yellow color of the oleo oil, was of a more granular nature, and in fact resembled boiled butter in every respect. When a small particle was stirred up with olive oil on a glass slide it separated readily. When covered and viewed with a pocket lens it revealed a mass of globules resembling insect eggs. Under the microscope these globules exhibited essentially the same characteristics as those obtained from butter in Experiment 1. The crystalline mass of the oleo globules seemed somewhat coarser, and to this condition was ascribed the fact that the cross, as well as the colors produced by the selenite plate, were less sharply defined than in the globules obtained from butter. The slides prepared from this material were remarkably free from the small detached crystals of fat observed in Experiment 3.

Experiment 8.—Havihg thus discovered that these globular masses may be obtained from pure tallow fat by simply observing the conditions, which obtain in butter making, the following test was made: Nine grams of oleo oil and one gram of lard were placed into a small breaker glass and eight to ten drops of a saturated solution of salt in water added. The mixture was then gently heated to melt the fats. After shaking violently for a few moments to mix the salt solution with the fats, the mixture was boiled gently for one minute and then allowed to cool as before in a wooden pill-box. The microsopic examination of this preparation revealed globular masses, which could in no wise be distinguished from those obtained from pure butter. The crystalline texture was dense, the cross of St Andrew's plainly marked and the colors produced by the selenite sharply defined.

Experiment 9—A mixture of one part of lard to five parts oleo oil was treated as in the last experiment with like results.

Experiment 10.—In this test a mixture consisting of 20 per cent. of lard and 80 per cent. oleo oil, was employed. Whether the consistency of this mixture was peculiarly adapted to the formation of the globules or whether possible variations of conditions in manipulation were more favorable, the writer is unable to judge from a single experiment, but the fact is, that in this case individual "butter crystals" were exceedingly large and characteristic.

Experiment 11.—From a mixture of equal parts by weight of oleo oil and lard characteristic "butter cyrstals" were obtained, the treatment, of course, being the same as in Experiments 8, 9 and 10. The globules, however, were comparatively small and were surrounded with small detached crystals of fat.

Experiment 12.—It is scarcely necessary to say that there must be a limit in the consistency of fatty mixtures, beyond which, either as the melting point rises or falls, the formation of these globular masses at the ordinary temperature of a working-room, is no longer possible. That this consistency, however, is not restricted to that of butter, nor to very narrow limits may be inferred from Experiments 7, 8, 9, 10 and 11, in which it must have varied by each increased addition of ordinary soft lard. There is also a limit in the consistency of fatty mixtures, beyond which they can no longer be sold for butter. It was, therefore, unnecessary for the object in view to make an experiment in which nothing but the soft lard was employed. This was done, however, with the same treatment as in the last experiments. The microscopic examination failed to reveal any of the characteristic globules. The crystals were small and detached, and these to a great extent dissolved in the warm olive oil after being mounted. The slide thus mounted was placed in a room, the temperature of which fell to about the freezing point during the night. The next morning the slide was white, owing to the solidification of the fats, and consisted of a mass of minute globules visibles with a pocket lens. Under the microscope, with polarized light, the cross of St. Andrew's was very plainly to be seen. Gradually, as the slide became warner, the globules could be seen, under the microscope, to disintegate into the crystalline scales of margarine or other fats, which composed them.

This experiment only goes to show that the globular masses obtained above can be produced from the more readily fusible fats, if the temperature is correspondingly lower.

Experiment 13.—A portion of butter was treated again as in Experiment 1, except that the boiling was more violent and continued for two minutes. The globules obtained were much smaller than those of Experiment 1, although they showed the same characteristics as the others. There were also observed a large number of isolated fat crystals.

Experiment 14. Another portion of butter was heated .until the boiling ceased. Owing to the discoloration of the casein by the higher temperature, the fat was strained through a piece of flannel into the wooden pill-box The microscopic examination revealed only a few "small crystals", and these were surrounded or imbedded in a mass of small detached crystals of fat.

Experiment 15 —About half an ounce of newly-churned unsalted butter was heated in a small glass beaker until ebulition ceased. It was then strained through a piece of flannel into a wooden pill-box, and allowed to cool. The microscopic examination revealed a very few widely separated but good specimens of the globular masses, and a larger number of smaller ones, all of which were surrounded by irregular masses of fat crystals.

THEORY OF THE FORMATION OF TAYLORS' "BUTTER CRYSTALS".

The more solid fats, stearine, palmatin and margarine, crystallize under favorable conditions in elongated pearly scales. The animal fats, as butter, tallow and lard, are, in general terms, mixtures of one or more of these fats with olein, a fat which is liquid at ordinary temperatures. It is a general law in crystallization that when individual crystals begin to appear, they invariably attach themselves to foreign solid bodies of any kind, if present in the crystallizing medium. If the foreign body is a minute speck which remains suspended in the crystallizing medium, crystals will begin to grow out from it simultaneously in all directions, and a globular mass of fine crystals is the result. This is exactly the way in which Dr. Taylor's "butter crystals" are formed. They consist of elongated scales of the solid fat of butter, radiating out in all directions from a central nucleus. The overlapping of these scales produces the effects which these globules present, when viewed with polarized light. The term "crystal," as applied to these globules, is ill chosen, as they are merely agglomerations of individual fat crystals.

From these considerations the action of salt and water in the production of the globular masses in butter as well as in other fats (Experiments 7 to 12) can readily be explained. The water of the butter coming in contact with salt forms in the course of time a saturated solution. For this reason a saturated solution of salt was employed in Experiment 8, and those following, instead of mixing the fat with salt and water, as in Experiment 7. When butter is boiled in a test tube for a minute, according to the directions of Dr. Taylor, a portion of the water which it normally contains, is evaporated. A corresponding amount of salt is forced to crystallize out. In doing so the crystals of salt produced are so minute that they remain suspended in the liquid fat. They form innumerable nuclei, around which, on cooling, the fat crystals of the butter arrange themselves, producing the globules, which are claimed to be characteristic in butter. This explains the difference of the behavior of the oleo oil with and without the addition of salt and water as well as the production of characteristic "butter crystals" in mixtures of this tallow fat and lard on the addition of a small quantity of a saturated solution of salt water before heating. Of course the writer does not claim that the salt grain is essential to the productian of a fat globule of this kind. It may be replaced by a speck of any other solid matter.

CONCLUSION.

Having thus described the production and nature of Dr. Taylor's "butter crystals," and having shown in the experiments given that they are not peculiar to butter, but that mixtures of tallow fat and lard under the conditions which obtain in butter making cannot by this means be distinguished from pure butter, it follows that so much of Dr. Taylor's microscopic investigations as pertains to the formation of characteristic crystals of these various fats is of no practical value in the examination of commercial butter for adulterations. Dr. H. J. Detmers, Professor of Veterinary Surgery of Ohio State University, has made a series of photographs of the prepared slides illustrating the experiments described above. The perfect representation of these globules photographed with polarized light must be regarded as a remarkable achievement in the art of micro photography.

EXPERIMENTS WITH SOIL.

There is no question more often put to the agricultural chemist by farmers who have worn out fields and who wish to increase the yield of their crops by the use of commercial fertilizers, than what ingredient or ingredients are wanting in these fields to produce an average crop.

The question is a legitimate one, since it would be throwing away money to apply any fertilizer deficient in an ingredient of plant food wanting in the soil. At the same time there is, perhaps, no subject on which the chemist is less able to give definite information. A simple analysis of a sample of the soil in question will not suffice, for reasons given in last year's report. (See Report Ohio Agricultural Experiment Station, 1884, page 228).

The testing of the soil should take place on the fields themselves, selecting a number of strips across the fields and applying to these a series of fertilizers of known composition, in the manner described below. The plants themselves are thus brought into requisition to determine the question, which, in most cases, is the only safe method to follow. It is evident that neither the Station nor the Department of Agriculture of the University, as at present constituted, can make these tests for the farmers throughout the State. In order that the Experiment Station may aid and benefit the farmer directly in this important matter, the writer has devised and in part tested a plan during the past season, which, it is hoped, subsequent experiments may prove feasible:

An excavation was made on the top of a side-hill underlaid with gravel, and thus naturally well drained. Into this excavation nine sewer pipes, two feet in length and fifteen inches in diameter, were placed on end and the earth placed around them to the top of the pipes. They were then filled to within six inches of the top with pure washed sand. The soil of the University farm being all in a high state of cultivation, and unsuitable for this reason, to be employed in the experiments about to be described, a field in the neighborhood was selected, the history of which for the last twenty or thirty years was well known to the writer. The soil of this field was formed in place from Huron shale. It was, therefore, a rather poor soil to begin with, but in addition to this fact, it had been farmed during the time mentioned, without the application of manure.

About six hundred pounds of the soil from this field was selected in the following manner: The field was crossed at fixed intervals with a wagon. Every eight or ten paces a square hole was dug with a spade to the sub soil. A slice about two inches thick and of the width of the spade was cut off on one side of the hole from the surface of the soil to the top of the sub soil and thrown into the wagon. Local contaminations were avoided, and any trash on the surface was removed by scraping before the sample was taken. The earth thus collected was thoroughly mixed. Forty pounds were then weighed off and placed into each of the sewer pipes, filling the space between the sand and the top of the pipes completely with soil. In this manner ten miniature plots were obtained, representing as nearly as possible the average of the soil of the field to be tested. On May 2d forty seeds of spring barley were planted in each plot. On May 5th the plots were fertilized as follows:

PLOT No. 1.

Complete Fertilizer.

Sodium nitrate	18.3	grams	per plot, equals	150	pounds per acre.
Superphosphate	30.5	"	"	250	"
Magnesium sulphate	24.4	"	"	200	"
Potassium chloride	12.2	"	"	100	"

PLOT No. 2.

Complete Mineral Fertilizer.

Superphosphate	30.5	grams	per plot, equals	250	pounds per acre.
Magnesium sulphate	24.4	"	"	200	"
Potassium chloride	12.2	"	"	100	"

PLOT No. 3.

Sodium nitrate	18.3	grams	per plot, equals	150	pounds per acre.
Magnesium sulphate	24.4	"	"	200	"
Potassium chloride	13.2	"	"	100	"

PLOT No. 4.

Sodium nitrate	18.3	grams	per plot, equals	150	pounds per acre.
Superphosphate	30.5	"	"	250	"

PLOT No. 5.

Sodium nitrate	18.3	grams	per plot, equals	150	pounds per acre.
Potassium chloride	12.2	"	"	100	"

PLOT No. 6.

Pure Nitrogen Fertilizer.

Sodium nitrate ....18.3 grams per plot, equals 150 pounds per acre.

PLOT No. 7.

Magnesium sulphate........24.2 grams per plot, equals 200 pounds per acre.

PLOT No. 8.

No Fertilizer.

PLOT No. 9.

Slaked lime.........................183.0 grams per plot, equals 1500 pounds per acre.

Plants made their appearance on May 7. No marked difference could be noticed for the first two weeks On May 28 the following notes were made:

Nos. 1, 2 and 4 showed a much more vigorous growth than the other plots, which were apparently alike in condition. Nos. 1, 2 and 4 had stooled out. On may 30 the plots were thinned out to the same number of plants in each. When fully ripe the barley was cut, tied in separate bundles and put away to dry. The grain was then separated from the straw by hand and the weight of grain and straw of each plot determined.

The results obtained are as follows, weight expressed in grams:

Plots.	Weight of grain.	Weight of straw.	Plots.	Weight of grain.	Weight of straw.
1.....................	52.4	82.4	6.....................	30.0	63.6
2.....................	41 6	96.6	7.....................	32.4	60.0
3.....................	22.4	4[illegible].0	8.....................	25.4	34.4
4.....................	42.0	82.0	9.....................	24.0	40.4
5.....................	26.0	52.4			

In making tests upon a field by fertilizing a series of strips in about the manner followed in the present experiment, in order to determine the essential ingredients of plant food that are wanting in the soil, only marked increases in yield over the plot not fertilized should receive attention. Taking this rule as a guide, the plots employed in this experiment may, at first glance, be divided into two classes, Nos. 1, 2 and 4 forming the one class, and all the remaining plots falling into the other.

Plots 1, 2 and 4 show a marked increase in grain and straw over plot 8, which received no fertilizer. They also showed a much more vigorous growth than the rest That this growth was not due to the effect of nitrogen may be seen from plot No. 2, which received no nitrogen fertilizer. These three plots have one ingredient in common, viz., superphosphate. Plot No. 4 contains, it is true, a nitrogen fertilizer, but in No. 2 this is wanting, and hence shown to be unnecessary to an increase of crop. This confines the marked increase of yield to the superphosphate. As superphosphate consists of phosphoric acid in combination with lime and mixed with sulphate of lime, and as both lime and phosphoric acid are essential ingredients in plant food, the question still would remain open whether the increase in yield was due to the more expensive phosphoric acid or to the cheaper lime. The question however is settled by referring to plot No. 9, which had a liberal application of lime, and which showed no increase in yield nor a better growth during the season.

From these considerations the application of phosphoric acid in the form of superphosphate for spring grains, or of fine bone meal for winter wheat or rye is decidedly indicated for this particular field. Furthermore, it would be a useless expense to purchase either potassium, magnesium, or nitrogen, either singly or combined, for the purpose of securing better crops.

The same plots were fertilized last fall in the same manner, and sown to wheat. The only thing that may be said of this experiment at this writing is that the only plots in which the wheat plants had stooled out when cold weather set in were plots Nos. 1, 2 and 4.

ANALYSIS OF FEEDING STUFFS.

CORN FODDER OR STOVER.

In the winter of 1884 to 1885 the writer was called upon to calculate the rations for milk cows of the University dairy. The feed on hand consisted of corn meal, clover hay, corn fodder and sugar beets.

A difficulty was encountered in making up a suitable ration from these substances, since all available analyses of corn fodder represented the whole plant. It is well known by experience that cattle eat only a part of the corn fodder whether it is fed whole or cut. In order to determine what proportion of the fodder was eaten, as well as the composition of the same, a large bundle of good fodder from the center of a rick, built the fall before, was selected for examination. This was divided by hand into two parts, the one consisting of the leaves, sheaths, husks tassels and one or two of the upper joints; the other of little more than the bare stalks. The weight of each portion was then determined, and the result for 100 parts by weight of fodder are as follows:

Part eaten (leaves, etc.)	58.19
Part not eaten (stalks)	41.81

COMPOSITION OF LEAVES, ETC.

Water	11 30
Ash	7.10
Protein	5.21
Crude fiber	27.44
Nitrogen—free extract	47.34
Fat	1.61
	100.00

COMPOSITION OF STALKS.

Water	9 00
Ash	4.10
Protein	3.86
Crude fiber	34.29
Nitrogen—free extract	47.26
Fat	1.49
	100.00

OAT HAY AND OAT STRAW.

During the season of 1884 a field of oats on the University farm was partly cut and cured for hay when the seed was in the milk, while the remainder was allowed to ripen. Average portions of the hay and straw were collected for analysis, it being the intention to use both the hay and straw in feeding the dairy stock.

The following analyses give the composition of the hay and straw in 100 parts:

OAT HAY.

Water	8.70
Ash	7.45
Protein	7.75
Crude fiber	25.10
Nitrogen—free extract	47.95
Fat	3.05
	100.00

OAT STRAW.

Water	8.15
Ash	6.65
Protein	4.00
Crude fiber	45.09
Nitrogen—free extract	33.54
Fat	2.57
	100.00

LINSEED MEAL—OLD PROCESS.

Water	8.07
Ash	6.00
Protein	32.20
Crude fiber	9.73
Nitrogen—free extract	37.97
Fat	6.03
	100.00

LINSEED MEAL—NEW PROCESS.

Water	12.25
Ash	5.30
Protein	34.19
Crude fiber	9.28
Nitrogen—free extract	35.48
Fat	3.50
	100.00

The sample of Old Process Meal was obtained from Chas. Boch, Colerain avenue, Cincinnati, Ohio. The sample of New Process Meal from Cincinnati Linseed Meal Co., No. 9, West Fourth street, Cincinnati, Ohio.

ANALYSIS OF CHEESE.

Two samples of cheese were sent for examination from Wellington, Ohio, by Mr B. B. Herrick, the one being a full milk cheese manufactured by B. B. Herrick, Wellington, Ohio, and the other what is known as "Chicago Flats." As the latter is alleged to be brought into market and sold as Ohio cheese, an analysis of the two samples was made in order to give the consumer an idea of their relative merits.

B. B. HERRICK'S FULL MILK CHEESE.

Water	35.42
Ash	2.47
Fat	31.66
Albuminoids and non-nitrogenous matter, not fat	30.45
	100.00

CHICAGO FLATS.

Water	52.73
Ash	2.69
Fat	2.68
Albuminoids and non-nitrogenous matter, not fat	41.90
	100.00

EXAMINATION OF DRINKING WATER.

The following potable waters have been examined for organic matter. The numbers represent the parts of organic matter in 1,000,000 parts of water:

1,	Well, Newark, Ohio	12.5
2,	“ “	9.5
3,	“ New London, Butler county	1.4
4,	“ “ “	4.7
5,	“ “ “	16.7
6,	“ Paddy's Run, “	5.6
7,	“ “ “	19.6
8,	“ “ “	1.4
9,	“ Wanseon, Fulton county	100.9
10,	“ 39 King avenue, Columbus, Ohio	24.8
11,	“ 35 “ “	13.9
12,	Spring, Kirtland, Trumbull county	37.6
13,	Well, “ “	57.1
14,	“ University	10.2
15,	“ West Woodruff avenue, Columbns, Ohio	40.0
16,	“ Farm house, University	10.4

ANALYSIS OF SORGHUM CANE.

Of the juice of Early Amber cane grown by the Experiment Station an analysis was made when the seed had reached the hardening dough stage. The results are as follows:

Specific gravity, at 20 degrees C.	10 B.	
Cane sugar	11.50	per cent.
Grape sugar	3.72	“

MUCK.

A sample of muck was sent by D. G. Heacock, Atwater, Ohio, with a request to determine whether it contained ammonia, phosphoric acid and potash. An examination revealed ammonia, phosphoric acid, lime and magnesia in abundance. The potash was present in less proportion.

SOIL AND SUBSOIL.

Mr. Geo. Collins, Millbury, Wood county, Ohio, sent a box containing a portion of soil and its subsoil for examination. The soil was black, rich in humus and the subsoil was clay. Mr. Collins stated in his letter that the soil failed to produce good crops and that barnyard manure and wood ashes seemed of no benefit. On examination the soil was found to be rich in ammonia, phosphoric acid, lime and magnesia, as well as ferric oxide. Hence, there seemed to be no lack of plant food. The only difficulty that suggested itself was probably an undue amount of ferrous salts. The remedies suggested were thorough drainage, fall plowing and an avoidance of plowing too deep at once.

FERTILIZER.

L. Reeve, Colebrook, Ashtabula county, Ohio, sent for analysis a specimen of a fertilizer taken from a large deposit, which, it was supposed, might contain an admixture of pigeon guano. It contained—

Phosphoric acid	0.27	per cent.
Nitrogen	0.35	“

Estimating the phosphoric acid at 8 cents per pound and the nitrogen at 20 cents per pound, the money value of this material, leaving out of consideration the ameliorating influence it would have on a heavy soil on account of the large amount of humus present, would be $1.83 per ton.

MANURE.

A sample of manure, taken from a pile 40x70x2½ feet deep, and kept under cover, was sent by John E Bruce, Eaton, Ohio, with a request to learn its composition and money value. As the manure was treated in a rational manner and was obtained from well fed stock, the following analysis of such a manure was sent:

Nitrogen	0.50	per cent.
Phosphoric acid	0.26	“
Potash	0.63	“
Soda	0.19	“
Lime	0.70	“
Magnesia	0.18	“
Sulphuric acid	0 16	“
Silica	1.68	“
Chlorine	0.19	“

From this analysis the money value of the manure was calculated and found to be $3.04 per ton.

BONE MEAL.

A sample of material sent by A. J. Shaffer, Freeburg, Ohio, taken from a sack of fertilizer, was found to be ground bone.

METEOROLOGICAL REPORT.

W B. ALWOOD.

A brief summary of the important meteorological conditions which prevailed during the year ending October 31. 1885, is here given:

An extended discussion of the subject is unnecessary, from the fact that the excellent reports of the Meteorological Bureau, issued regularly each month, cover the entire subject and are to be obtained by addressing the secretary, at Columbus.

Table I. gives a general summary of the meteorological conditions prevailing over the entire State. Table II relates distinctly to the conditions prevailing at this Station, and Table III. compares the other two as to temperature and rainfall and also compares them with the normal mean for the State.

This latter is made up from a series of observations covering a long period of years.

The year shows quite a deficiency in average temperature, being nearly 3° below the normal for the State and 2.5° below the average of the previous year.

The normal rainfall for the State is 40 41 inches. Here also is an average deficiency for the State, amounting to about two inches, though the record for this station shows an excess of nearly two inches.

By reference to Table III. it will be seen that the rainfall for this station is above the normal for every month from April to September, except July. The precipitation, however, was so distributed through the month that it did not seriously interfere with farming operations. It will also be seen from this table that there was a deficiency in average temperature for every month of the year, except July and October, and in the latter month there is a deficiency at this station. This deficiency is especially marked during January and February.

The extremes of temperature for the State vary but little from the previous year, both years being marked by the great severity of their winters. The maximum, 101°, which was recorded at the Station the past year, has not been reached for some years in this State; the minimum, 34.4° below zero, is but .4 below the previous year. While the winter, as a whole, was not more severe than the previous, yet the conditions were such that wheat was badly injured, being not half a crop. So far as our observation extended, this was not caused so much by freezing or heaving out, as by being actually frozen to death in the soil.

Excepting wheat, the harvests were more than usually abundant.

The past year is the first for a series of years that has not been marked by a severe drouth visiting some portion, and many times a considerable part of the State has suffered.

The abundance of moisture, especially during August, doubtless aided the ravages of the potato rot, which inflicted severe loss on some localities. The slight precipitation of March is pheromenal.

TABLE I.—STATE SUMMARY FOR THE YEAR BEGINNING NOVEMBER 1, 1884, AND ENDING OCTOBER 31, 1885.

Month.	Mean temperature.	Highest temperature.	Date.	Lowest temperature.	Date.	Range of temperature.	Mean daily range of temperature.	Greatest daily range of temperature.	Date.	Least daily range of temperature.	Date.	Total rainfall for month.	Average daily rainfall.	Prevailing direction of wind.
November	39.4	78.0	1st.	4 7	24th.	73.3	20.0	48 0	10th.	1.5	29th.	1.39	.046	S. W.
December	30.2	69.0	4th.	—32 4	19th	91.0	17.3	50.0	4th.	1.5	8th.	3.69	.119	S. W.
January	22.6	76.0	9th	—31.0	29th	107.0	18.1	58 5	30th.	1 2	7th.	4.16	.134	S W.
February	19.3	62.3	28th.	—27.0	13th.	86.6	22.1	58.0	10th	4.0	*[1]	1 85	.066	S. W.
March	29.1	76 0	31st.	—9 8	21st.	85.8	19.4	46.0	*[2]	3 0	5th.	.81	.026	W.
April	48.5	92 0	23d.	11.5	4th.	80.5	21.6	50 0	2d.	1.0	18th.	3.17	.106	S. W.
May	59.5	91.0	5th.	21.0	3d.	70.0	23.0	50.5	15th.	3.0	9th.	3.97	.128	S. W.
June	67.1	96.0	7th.	36 0	23d.	60.0	24.2	46.0	11th.	8.0	5th.	4.34	.145	S W.
July	75.2	101.0	21st.	40 0	1st.	61.0	22.8	43.0	4th	6.1	22d.	3.20	.103	S. W.
August	68.9	98.0	1st.	40.0	27th.	58.0	20.2	42.0	21st.	4.3	10th.	6.33	.204	N. E.
September	62.9	95 0	19th.	28 0	2d.	67.0	22.0	46 0	25th.	3 0	10th.	2 49	.083	S. W.
October	62.9	83.0	18th.	14 0	31st.	69.0	20.4	45 0	*[3]	4.5	6th.	3 30	.106	S. W.

Only thermometers which have been compared with the standard have been used in making up the averages.

*[1]—16th and 26th. *[2]—4th and 16th. *[3]—10th and 18th.

Mean temperature	48.8	degrees.
Highest "	101.0	"
Lowest "	—34.4	"
Range of "	135.4	"
Mean daily range of temperature	20.9	"
Greatest " "	58 5	"
Least " "	1.0	"

Number of clear days	108.9
" fair "	131.5
" cloudy "	124.5
" days on which rain fell	145.4
Total rainfall for year	38.7 inches.
Average daily rainfall	.105 "
Prevailing wind	S. W.

TABLE II.—SUMMARY OE OBSERVATIONS AT THIS STATION THE YEAR ENDING OCTOBER 31, 1885.

Month.	Mean temperature.	Highest temperature.	Date.	Lowest temperature.	Date.	Range of temperature.	Mean daily range of temperature.	Greatest daily range of temperature.	Date.	Least daily range of temperature.	Date.	Total rainfall for month.	Average daily rainfall.	Prevailing direction of wind.
November	37.9	66.0	10th.	12.0	24th.	54.0	23.2	37.0	9th&22.	7.5	30th.	1.13	.038	S. W.
December	28.8	59.0	5&31	21.0	19th.	80.0	20.6	37.0	28th.	6.0	12th.	3.87	.125	N.W.
January	21.1	53.0	6th.	10.0	22&29	63.0	18.9	35.0	30th.	16.0	16th.	4.03	.130	S. W.
February	17.8	55.0	2d.	20.0	21st.	75.0	25.7	55.0	2d.	11.0	4&26	3.17	.113	S. W.
March	29.4	64.0	31st.	0.0	20th.	64.0	20.6	36.0	31st.	7.0	2d&4th.	0.98	.032	N.W.
April	49.0	84.0	23d.	17.0	14th.	67.0	25.3	43.0	2d.	10.0	15&17	4.51	.150	N.W.
May	59.3	86.0	18th.	29.0	11th.	57.0	26.1	44.0	16th.	13.5	9th.	5.92	.191	S. W.
June	65.8	91.0	7th.	40.0	30th.	51.0	22.7	36.5	19th.	15.5	16th.	4.84	.161	S. W.
July	75.2	101.0	21st.	41.0	1st.	60.0	28.5	40.5	20th.	15.5	10th.	3.01	.097	S. W.
August	69.5	94.5	1st.	43.0	27&28	51.5	24.5	36.5	18th.	10.0	3d.	5.50	.180	S. W.
September	62.8	87.8	18th.	33.0	24th.	54.0	28.2	44.0	25th.	12.0	10th.	2.00	.087	S. W.
October	48.6	77.0	1st.	20.5	31st.	56.5	24.9	43.0	11th.	10.0	14th.	3.12	.101	N.W.

Mean temperature for year	47.1 degrees.
Highest " "	101.0 "
Lowest " "	—21.0 "
Range of " "	123.0 "
Mean daily range of temperature for year	24.1 "

Greatest daily range of temperature for year	55.0 degrees.
Least " " "	6.0 "
Total rainfall	42.08 inches.
Average daily rainfall	.115 "
Prevailing wind	S. W.

TABLE III.—MEAN TEMPERATURE AND RAINFALL FOR THE YEAR ENDING OCTOBER 31, 1885.

	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.
	Degrees.	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degrees.*	*Degs.*
Mean temperature for the State	39.4	30.2	22.6	19.3	29.1	48.5	59.5	67.1	75.2	68.9	62 9	62.9
Mean temperature for this station	37.9	28.8	21.1	17.8	29.4	49.0	59 3	65.8	75.2	69.5	62.8	48.6
Normal mean for State	41.6	32.0	28.9	32.3	38.2	50.5	60.7	70.4	74.5	72.2	65.4	52.3
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Ins.*
Mean rainfall for state	1.39	3.59	4.16	1.86	0.81	3.17	3.97	4.34	3.20	6.33	2.49	3 30
Rainfall for this station	1.13	3.87	4.03	3.17	0.98	4 51	5.92	4.84	3.01	5.50	2.00	3.12
Normal mean for state	3.26	3.24	2.65	2.51	3.37	3.49	3.85	4.02	3.90	3.76	3.63	2 73

Mean temperature of the State .... 48.8 degrees.
Mean temperature of this station .... 47.1 degrees.
Normal mean temperature of State .... 51.6 degrees.

Total rainfall for the State.............................. 38.70 inches.
Total rainfall for this station............................ 42.08 inches.
Normal rainfall for State .... 40.41 inches.

REPORT ON FORESTRY.

The following is a list of the principal timber trees of Ohio. Few States can boast of a larger number of valuable varieties:

Cucumber Tree	Magnolia acuminata.
Tulip Tree. Yellow Poplar. White Wood	Liriodendron tulipifera.
Basswood. Linden	Tilia Americana.
Ohio Buckeye	Æsculus glabra.
White or Silver Maple	Acer dasycarpum.
Red or Soft Maple	Acer rubrum.
Sugar or Rock Maple	Acer saccharinum.
Ash-leaved Maple. Box Elder	Negundo aceroides.
Black or Yellow Locust	Robinia Pseudacacia.
Kentucky Coffee Tree	Gymnocladus Canadensis.
Honey Locust	Gleditschia triacanthos.
Wild Black Cherry	Prunus serotina.
Tupelo. Peperidge. Sour Gum	Nyssa multiflora.
White Ash	Fraxinus Americana.
Green Ash	Fraxinus viridis.
Black or Swamp Ash	Fraxinus sambuciflolia.
Blue Ash	Fraxinus quadrangulata.
White Elm	Ulmus Americana.
Red Elm. Slippery Elm	Ulmus fulva.
Hackberry. Sugar Berry	Celtis occidentalis.
Common Mulberry	Morus rubra.
Buttonwood. Plane. Sycamore	Platanus occidentalis.
Butternut	Juglans cinerea.
Black Walnut	Juglans nigra.
Shell-bark Hickory	Carya alba.
Large Shell-bark	Carya sulcata.
Small Fruited Hickory	Carya microcarpa.
White-heart Hickory	Carya tomentosa.
Pignut Hickory	Carya porcina.
Butternut Hickory	Carya amara.
White Oak	Quercus alba.
Post Oak	Quercus obtusiloba.
Bur Oak	Quercus macrocarpa.
Swamp White Oak	Quercus bicolor.
Yellow Oak	Quercus castanea.
Red Oak	Quercus rubra.
Scarlet Oak	Quercus coccinea.
Black Oak	Quercus tinctoria.
American Chestnut	Castanea vesca.
Beech	Fagus ferruginea.
Sweet or Black Birch	Betula lenta.
Yellow Birch	Betula lutea.
Paper or Canoe Birch	Betula papyracea.
Red or River Birch	Betula nigra.
White Willow	Salix alba.
Cottonwood	Populus nonilifera.
Pitch Pine	Pinus rigida.
White Pine	Pinus strobus.
Hemlock	Tsuga Canadensis.
Red Cedar	Juniperus Virginiana.
American Larch	Larix Americana.

The above list contains more than fifty varieties of valuable timber trees. In addition, there is found growing within the borders of the State many imported varieties, some of which are being extensively planted. The Station has not tested these sufficiently to feel warranted in recommending them to tree growers in preference to our best native species.

COMPARATIVE GROWTH AND HARDINESS OF FOREST TREE SEEDLINGS.

The following table presents a brief synopsis of the results of some experiments in forest tree culture:

Variety.	When planted.	Age when transplanted.	Per cent. killed by severe winter.	Size at end of season, 1885. Height.		Circumference.
				ft.	*in.*	*in.*
Red Oak	1883	Seedling	20.4	4	0	3⅛
Chestnut	"	"	55.5	3	7	3¼
White ash	"	"	5.7	5	8	4
Catalpa	"	"	8.2	7	3	9½
Beech	"	"	38.6	1	5	1¾
Black ash	"	"	1.0	4	0	4⅛
Wild cherry	"	"	6.1	9	3	5⅝
Scarlet maple	"	"	1.2	3	4	3¾
Green ash	"	"	0.0	6	4	5
Sugar maple	"	"	6.9	3	3	2⅝
White oak	"	"	81.1	2	2	2⅜
Black walnut	"	2 years...	50.9	4	0	3¾
Red oak	"	Seedling	5.2	3	6	2⅞
Yellow locust	"	2 years...	0.0	14	0	7¾
Cucumber	"	Seedling	33.3	2	2	2
Ky. Coffee tree	"	"	4.0	2	4	2¾

Lack of space forbids the publication of any further notes on the subject of forest-tree culture, or the Station's tests with hedge plants and evergreens.

SAMPLES OF STATION CORRESPONDENCE.

The following samples will serve to illustrate the character of the correspondence of the Station during the past year. An average of more than six letters of similar nature were received each day. These letters of inquiry are in addition to the regular business correspondence of the Station, which is very large:

GOLDEN CORNERS, WAYNE COUNTY, O., *Jan.* 6, 1885.

William R. Lazenby:

DEAR SIR: Have you had any experience with millet? If so, will you please tell me how many pounds it takes to sow an acre, and which is the best variety for clay land.

Is the Experiment Station ready to analyze soil, and what is the cost of having it done?

Yours truly,

T. A. ARMSTRONG.

ANSWER.

We have tested several varieties of millet, and find the "Golden" the best. While it makes good hay, think, on the whole, that the millet family is better for green feeding. From 16 to 20 quarts of seed should be sown per acre. It does better on loamy land, but will produce a good crop on any good soil. The ground must be well fitted in order to secure a good stand.

The Station can analyze soils, but this rarely pays, unless there is some marked peculiarity. We will carefully examine a sample of your soil, if you choose to send it; and if, in your judgement, an analysis will be of any value, it will be made free of charge. Send six to eight pounds of soil—taking pains to get a fair average sample—in a small box by express.

CENTER VILLAGE, DELAWARE COUNTY, O., *Jan.* 31, 1885.

Professor Lazenby, Columbus, Ohio:

DEAR SIR: I was informed the other day that you would answer questions in regard to farming. I would be glad to have your opinion on one point. I have 17 head of two year old steers tied in stanchions; am feeding hay only. Now, will it pay me to feed these steers corn, or will it pay better to feed the corn to hogs next summer? The steers are doing very well; they have a warm room, and a good straw bed. I do not let them out only to haul the manure once in about 14 days.

Please answer, and very much oblige,

M. B. C. RICH.

ANSWER.

At present prices of beef and corn, it will most assuredly pay to feed two year old steers corn. I should do so, if I had to buy every bushel. Whether you will make more by feeding hogs next summer, I am not prepared to say. This will depend upon the age of the pigs, price of corn and pork at that time, etc. But as far as my experience and observation go, you will make no mistake feeding the steers.

If you can grind the corn, this will pay; will unless you have pigs enough to eat all that passes undigested. If you have convenience for weighing, I would advise you to test the matter for yourself. You could do it in this way: Take, say five, of your steers and weigh them together, then weigh at the same time another lot of five that seem to be in about the same condition. Feed both lots the same amount of hay, and feed one lot a bushel of corn per day in addition. If you intend to keep your steers over another year, I should not recommend heavy feeding of corn; but I believe a few ears given each steer every day will bring you a handsome return.

DAYTON, OHIO, *January* 8, 1885.

Prof. Lazenby:

Enclosed with this you will find a heliotrope plant with several singular root appendages that I yesterday exhibited at the meeting of the Montgomery County Horticultural Society. No person there being capable of giving any explanation of its formation, I was requested to forward it to you for such light as you could cast on the subject, as you will see by the accompanying printed slip.

I have seen similar formations before on the roots of geraniums, sissus vines and perhaps other plants.

My view is that each whorl of appendages along this central axis is a growing point, a long or underground stem, that under favorable conditions might produce a plant.

I have now two specimens taken from this plant when they were fresh, that under favorable circumstances of warmth and moisture, seem to be growing.

Please give the matter such attention as you deem the subject worth and report to me, and I will take pleasure to lay the matter before our society at its next meeting, the first Wednesday in February.

Respectfully,

D. McCARTHY.

ANSWER.

I regret to have kept you waiting so long for the answer to your inquiry of January 8.

The peculiar development shown by the specimen received is not a modified root, as I at first supposed, but simply a branch that has grown under ground. The appendages along these branches are simply reduced or modified leaves, which have become greatly thickened and distended with a deposit of starch. The internodes of the branch have not elongated, hence the leaves are small and crowded together.

I was assisted to this conclusion by the well known specialist, Prof. J. C. Arthur, of Geneva, N. Y. Your own view of this peculiar development was approximately correct.

I should be most happy to receive further illustrations of this freak.

ONTARIO AGRICULTURAL COLLEGE,
GUELPH, *February* 3, 1885.

DEAR SIR: I have heard that you have an interesting apparatus for testing the vitality of seeds. You would confer a great favor if you would send me a report regarding tests with it, and also where I could secure such apparatus for our own use.

Yours respectfully,
J. HOYES PANTON,
Prof. Nat. Hist. Agl. Coll'ge, Guelph.

PROF. LAZENBY, *Ohio Exp. Station.*

ANSWER.

I mail you our first and second Reports, from which you can learn what we are doing in the way of seed testing. In our first Report, page 114, is given a brief description of the seed-tester used at the Station, which, with the aid of the rude drawings enclosed, you will readily understand how to construct. This apparatus gives much better satisfaction than anything else I have ever seen.

I think there is no place where they are made and I know of but one other place where they are used. The one for the Station was made in Columbus by a tinsmith and the enclosing box by a carpenter, under our direct supervision, the whole costing about $15.00, including a small oil stove for heating. We find, however, that a good lamp with a burner made to use without a chimney will give a high enough temperature for most seeds and is more easily regulated.

If there is anything that you do not fully understand about the description or drawing I will be glad to explain.

Do you publish a report of the operations at the college? If so, will you please mail copies to the officers of the Station, as given in the upper right hand corner of this sheet, and a copy to the Experiment Station library?

GREENTOWN, O., *Feb.* 19, 1885.

Professor Lazenby:

DEAR SIR: Allow me to ask you why it is that wheat after barley is so much better than after oats, soil being the same in every particular? Oats and barley sown in the same field, and then followed with wheat can be noticed almost as far as you can see the field.

An early reply will greatly oblige.

Respectfully yours,
W. G. JOHNSTON.

ANSWER.

Yours of the 19th is just at hand. The only reasonable explanation of the question you ask is this: Oats occupy the land for a longer period, and, as a rule, yield a much heavier crop in total weight of straw and grain. It is also claimed by some that the oat roots, being larger and growing deeper, leave light soils in a poorer condition mechanically than does barley. Whatever the explanation, the fact observed by you holds true in nearly all sections of the country where these three grain crops are grown.

You may like to know what the difference in chemical composition is between the oat and barley, so I append averages of a large number of analyses:

	Per cent. of ash.	Potash.	Lime.	Phosphoric acid.
Barley—grain, 34 analyses, . . .	2.5	21.9	2 5	32.8
Oats—grain, 20 analyses, . . .	3.0	15.9	3.8	20.7
Barley—straw, 17 analyses, . .	5.1	21 6	7.6	4.3
Oat—straw, 6 analyses, ...	5.1	22.0	8.2	4.2

You see from the table that, weight for weight, the comparative power of these two crops to exhaust the soil is not explained by any difference in chemical composition. The cause first assigned is undoubtedly the main one.

WAUSEON, O., *May* 4, 1885.

DEAR SIR: I send you to day a plant, the name of which I desire. It grows in moist and wet ground in the woods, and is generally our first plant to blossom in the spring. I have never heard any name for it, and as I am not much of a botanist, I cannot identify it.

I am, very respectfully,
THOS. MIKESELL.

ANSWER.

The plant you sent for name is a species of Bitter cress (*Cardamine rhomboidalis*, var. *purpurea*, Torr.), one of our spring flowers, belonging to the natural order *Cruciferæ* or Mustard family. Usually found in wet woods, but occasionally intrudes upon damp meadows.

We will take pleasure in identifying all plants you may send us for that purpose.

To a valued correspondent who does not care to have his letters or name published, the Statiom made at one date, the following reply:

ANSWER.

It is not an easy matter to give the grounds upon which we base an opinion concerning any particular seedsman, yet it is scarcely possibly to have dealings with different firms and still not have an opinion concerning each. A good opinion may often come from some personal favor, and a bad opinion may come from some fancied or real slight.

In order to be as fair as possible, I will give you a few fact concerning each firm, which will enable you to see whether the opinion is just:

Peter Hendersok & Co., have a high reputation, and we have found them reliable. A few facts, however, tell against them. They frequently send out varieties with their name attached that are really the same as other seedsmen sell under other names. Henderson's First of All Pea they claim to be the earliest known, but we find it no earlier, but identical with Phil. Extra Early. Their Premier cabbage is a fair strain of Early Etampes. They puff these things highly, and sell for high prices, but their goods, with few exceptions, are not superior to those of other seedsmen.

D. Landreth & Sons are reliable, but they have some failings. A prominent one is the habit of renaming old things. They have done more to confuse vegetable nomenclature than any other firm. It is almost impossible to select from their catalogue any desired variety that you may have obtained from another source, simply because it is given another name, or perhaps some little variation is given the name, so as to make it unrecognizable. Their seeds, however, are always fresh and good, with perhaps a few exceptions. Many varieties of their cabbage are not so carefully selected as they might be, but in general, their seeds are very pure and never fail to germinate.

James Vick has as good seeds as can be obtained anywhere. He cuts down the list of varieties by excluding those that are known to be worthless, and I know from personal observation that he tests everything carefully before sending out. Vick buys much of his seed, but is very careful to buy only of reliable growers, and generally does not buy until he tests the seed.

D. M. Ferry & Co. have always sent us good seeds, but some of their commission seed obtained at groceries was of a very low vitality. They handle different grades of seeds, but if one is sure that he is getting their best grade he may be satisfied, for he could do no better, but he certainly could do no worse than to get their second grade. They are large growers and large buyers, and it is scarcely possible that everything they handle should be the best to be found.

J. J. H. Gregory is a practical man and knows his business. His seeds are usually good, but he is disposed to charge pretty high for his good name. He has also a trick of entrapping the unwary with a long list of novelties, and sometimes he forgets to mention the failings of his pets, even when he must have plenty of time to discover them. As an instance, his Gen. Garfield Tomato was worse than worthless, although sold at a high price, but after the first season he had nothing to say about it. He usually lets his pets die a natuaral death and gives them no funeral. A person must know just what he wants if he buys of Gregory, otherwise he may pay a big price for some worthless novelty. If he knows what he wants Gregory can supply it, and of good quality.

W. Atlee Burpee may have good seeds for sale, but some of his seeds tried this season are very badly mixed.

Isaac Tillinghast makes a speciality of Puget Sound grown cabbage seed, and claims it to be the best in the world, but our trials do not show it to be such, nor as good as some others.

A. W. Livingston's Sons, of this city, take the lead on tomatoes, but they buy most of their other seed.

There are others with whom we have had dealings, but this letter is already quite long. If you have any questions to ask concerning any particular firm, I shall be gland to answer, if I can.

MECHANICSBURG, CHAMPAIGN CO., O.

Will you please to give me at your earliest convenience the value of corn cobs as a fertilizer.

J. J. WARE.

ANSWER.

Your inquiry in regard to the value of corn cobs as a fertilizer is at hand. The value of the cobs depends very much upon the nature of the soil upon which they are to be used. For a heavy clay soil they would undoubtedly prove very serviceable, as they would have an excellent mechanical effect. Upon light soils, sandy loams or muck, it is not likely that their application would be very profitable.

The analysis of corn cobs is as follows:

Water	10.0 parts.
Organic matter	83.0 "
Ash	2.8 "
Albumenoids	1.5 "
Carbohydrates	44 0 "
Crude fiber	38 0 "
Fat, etc	1.5 "

This is the approximate composition of the whole cob. The chief value of the cob as a fertilizer lies in the ash. The analysis of the ash is as follows:

Potash	47.0 parts.
Silica	26.5 "
Phosphoric acid	4.5 "
Lime	3.5 "
Magnesia	4.0 "

Together with a small per cent. of soda, sulphuric acid, and traces of other elements.

You will notice that the percentage of potash is quite high, while that of phosporic acid and lime is comparative low. I have seen corn cobs used with excellent results upon stiff clay soil, but whether that effect was due to the elements of plant food contained within themselves or was strictly due to mechanical effect that the cobs had upon the soil, I am unable to say.

If you can obtain cobs cheaply and can apply them to heavy soil without much expense, I should certainly advise you to test the matter thoroughly, and I should be pleased also to know the results.

AKRON, OHIO, *March* 21, 1885.

DEAR SIR: In answer to your card of the 25th, ult., I will say plum tree culture I understand quite well. In plum raising I am not so successful, and on this point I need a few "pointers."

Respectfully and truly yours,
M. HARTER.

ANSWER.

Your trouble is doubtless due to the curculio, which stings the plums before they are mature. If such is the fact, the best plan is to jar the trees and catch the insect on sheets spread underneath the branches on the ground. This should be done every morning, quite early, from the time the trees are in bloom until the stones of the plums harden, which is usually three or four weeks. Prepare a sheet large enough to reach as far as the branches extend. Spread this on the ground around the tree, then jar the tree by giving several sharp blows with a long handled mallet on a spike driven into the body of the tree or upon the stub of a limb cut off for the purpose. The curculios will fall upon the sheet, and can be easily gathered and burned, as they "play possum" when frightened This plan does not take very much work when you are once prepared for it, and it will usually be found to be quite profitable.

If this does not meet your wants let us know.

MELROSE, PAULDING COUNTY, OHIO, *August* 15, 1885.

DEAR SIR: What is your advice in regard to winter protection for strawberries? Shall I cover them with straw? If so, what kind? How thick should the straw be put on? Should I use wheat or oats straw? I have been recommended to sow oats to protect them. I would like your advice. I have 1,000 plants, set spring of 1885—varieties, Wilson and Sharpless.

Respectfully yours,
J. W. TURNER.

ANSWER.

Swamp hay is the best material to cover strawberry plants. If it cannot be obtained, you can use any convenient material that does not pack too closely together, so as to smother the plants. Wheat or oat straw is very good, if free from weed seed. If the straw contains wheat or oats they are not so bad as timothy, clover or weed seed. Leaves are good, but blow off easily. It is a good plan to put forest leaves on thickly between the rows and then to cover the whole surface with straw. Do not put leaves directly over the plants. You may put straw on as thickly as you please between the rows. the more the better; but the plants should be covered merely enough to hide them from sight One or two inches is enough. Cover in December or as soon as the ground freezes. In the spring part the straw over the rows, so as to allow the plants to come through.

There is difference of opinion as to the practice of sowing oats. If the oats are quite thick and make a good growth they will afford considerable protection, but to grow them takes from the soil food required by the plants. If the plants have made a good growth early in the season and the soil is rich, the plan may be a good one, otherwise, not. The better plan usually is to keep the patch clean so as to secure a good growth of plants and then to cover with some good material.

Mr. Will Housel, Canton, O., wrote a long letter, asking for information on the general subject of fruit culture.

ANSWER.

Almost any soil that is moderately rich and well drained is suited to the fruits named. Up-land is usually better than bottom land for fruit trees, but whether the soil is sandy or clayey does not matter greatly. A well drained clay loam is usually preferred, however. Drainage is important, as no kind of fruit tree will do well where water stands for any length of time. Soil that will grow good farm crops is rich enough.

Authorities might differ as to varieties, and much depends upon your purpose in planting, whether for market or for family use. Presuming the latter to be your purpose, the following list will probably meet your requirements. The varieties are named in the order of ripening, not in the order of excellence:

Plums.—Yellow Gage, Washington, Green Gage, Lombard.

Cherries.—May Duke, Early Richmond, Gov. Wood, Black Tartarian.

Pears.—Dearborn's Seedling, Bartlett, Louise Bonne de Jersey, Duchess de Angoleme, Sheldon, Lawrence, Beurre Eas. Bartlett does not do well as a dwarf. Standard trees will probably give you better satisfaction than dwarfs.

Peaches.—Alexander, Early York, Crawford's Early, Old Mixon Free, Stump the World.

Grapes.—Worden (black), Brighton (red), Lady (white), Concord.

Currants.—Red Dutch, White Dutch, Cherry.

Gooseberries.—Houghton, Downing, Smith's Improved.

Blackberries.—Snyder, Taylor (the only hardy kinds).

Raspberries.—Doolittle (black), Ohio (black), Gregg (black), Turner (red), Cuthbert (red). Black and red ripen at the same time.

There are many other good varieties than those named, but these are among the best.

The nursery firm named is a good one. So are Elwanger & Barry, of Rochester, N. Y., and Storrs, Harrison & Co., of Painesville, O. You can, however, do just as well to buy of some smaller nursery nearer home. B. F. Berlin, of Louisville, Stark county, G. W. Dean, of Kent, Portage county, and J. L. Green, of Granger, Medina county, could doubtless give you as good satisfaction as to quality and prices as you could get anywhere. Do not, under any considerations, patronize an agent, unless you are personally acquainted with him and feel sure of his honesty. Any of the firms named will sell you trees for about half the price an agent can, and the trees will be true to name.

STRONGSVILLE, O., *July* 9, 1885.

W. S. Devol:

DEAR SIR: * * I enclose specimen of what some of our farmers call Buffalo grass, others Poverty grass. I think it only takes the place of grass where it dies out through poverty of soil. I send you specimens 1, 2, 3, 4.

No. 1—Buffalo or Poverty grass, found only in poor pastures or meadows. No. 2—A hardy early grass called here Rye grass. No. 3—A grass found in shady or moist places. No. 4—Comparatively new here; an Englishman tells me it was called "Lambs foot" in England and sowed there, and prized because it started so quickly after cutting. A down-east Yankee says, "we used to find it a nuisance in Southern clover seed, and we called it Southern Plantain."

Respectfully yours,

W. E. GALLUP.

ANSWER.

Plants received, and names below:

No. 1—*Dauthonia spicata*, Beauv., Wild Oat Grass.

No. 2—*Panicum dichotomum*, L., Panic Grass.

No. 3—*Festuca elatior*, L., Tall Fescue. Meadow Fescue.

No. 4—*Plantago lanceolata*, L., Ribgrass. Narrow-leaved Plantain. Buck Plantain.

Nos. 1 and 2 are wild grasses, of no value, sometimes a little troublesome in pastures, and No. 2 in cultivated ground. The names you give are not used in speaking of these species, and No. 2 should never be called Rye grass, for there is a genus designated by that name—the *Loliums*. No. 3 is quite a valuable pasture and meadow grass, worthy of extended cultivation in moist situations. No. 4 is quite a bad weed wherever established. It has been sowed in this country for sheep pasture, much to the discomfort of the experimenter. It is not valuable for pasture, and should be destroyed wherever found.

SHORT CREEK, O., *Feb.* 16, 1885.

Mr. W. R. Lazenby:

DEAR SIR: Thousands of bushels of corn have been brought to this county from the West, mostly from Indiana, and sold to farmers for feeding stock this present winter, and it now appears that much will yet be required. We find there is a prejudice against Western corn. Some claim it is not so good, that it will require more of it to accomplish the same result than of the home grown. Some men carry this notion so far as to pay 8 to 10 cents per bushel for the home grown ear corn in preference to the Western article shelled. Now, I believe that these men are prejudiced; and that, pound for pound, there is no difference to speak of in the real nutritive ingredients, but I can't prove it.

My object in writing to you is to ascertain if the Experiment Station, either by analysis or by experiments in feeding, or both, can give us the actual facts in the matter. That there should be any special difference in sound corn, simply because one sample was grown in Indiana, and one is Eastern Ohio, is more than I can comprehend.

I would be pleased to have your opinion on the subject.

Yours truly,

HIRAM COPE.

ANSWER.

I answer to your inquiry of the 16th inst. I would say that corn, well grown, properly matured, and carefully preserved, what we call good sound corn, does not show a very marked variation in chemical composition.

The feeding value of samples of the same grade is about the same for the same class or race of corn, no matter where it was grown. If the corn is in the ear, its quality is readily determined on sight. The quality of shelled corn is not quite so evident. As a rule, any sample of the same general class of corn that shows a good weight per measured bushel is of good quality, and about equal nutritive value.

The following table will give you some interesting chemical information. The Station has made no tests of the value of different samples of corn in practical feeding:

COMPOSITION OF CORN KERNELS—AVERAGE.

Class of corn.	Total dry matter.	Protein.	Fat.	Nitrogen, free extract.	Fiber.	Ash.
Dent, 77 analyses	89.9	10.3	5.1	70.6	2.2	1.5
Flint, 63 analyses	88.9	10.6	5.0	70.0	1.7	1.4
Sweet, 24 analyses	91.4	11.7	8.3	66.5	2.8	1.9
Oats, 21 analyses	89.3	11.3	5.0	61.0	9.0	3.0
Wheat, 300 analyses	89.5	11.8	2.1	71.9	1.7	1.8

WELLINGTON, O., *July* 24, 1885.

W. S. Devol:

DEAR SIR: * * * * I send you to-day four specimens. Nos. 1 and 2 are new weeds, the first I ever saw. I found No. 1 in a newly seeded clover meadow, and No. 2 on river bottom. No. 3 is very common, growing in pastures and on hill-sides. It lies flat on the ground like purslane; I don't think stock ever eat it. No. 4 grows on river and creek bottoms. It is 4 to 6 feet high, in clumps of 4 to 8 or 10 stalks; also found in pastures and fence corners, in many places growing so thick as to cover up and nearly smother the grass; it has a large hard root, covered with small lateral roots. It is hard to dig up, and very difficult to kill except by digging out. A great nuisance and spreading.

Very truly yours,

E. W. HOUGHTON.

ANSWER.

Names of the four specimens of plants sent me are as follows:
No. 1—Bearded Plantain, *Plantago aristata*, Mx.
No. 2—St. Johnswort, *Hypericum perforatum*, L.
No. 3—Euphorbia or Spurge, *Euphorbia maculata*, L.
No. 4—Actinomers, *Actinomeris squarrosa*, Nutt.

Concerning No. 1, see our Third Annual Report, page 169. No. 2 has been for many years regarded as a very pernicious weed in Eastern United States, and like others of the same class of plants is moving westward; it is a hardy perennial, soon over running neglected fields. No. 3 is a native of the United States, and is common in gravely soils and in roadways little used; it is not thought very troublesome. No. 4 is seldom regarded a bad weed, as it seldom advances into cultivated fields. It prefers rich and rather wet soils. Mowing several times a season usually destroys it.

ASHTABULA, O., *February* 1, 1885.

Prof. W. R. Lazenby:

DEAR SIR: Have you at hand, or can you make an analysis, showing the feeding value of the Hubbard squash?

I raised about an acre and one-eighth of squash last year, in amount, about 14 tons. I did not keep an account of the expense, but would say that it was less than the cost of raising the same amount (in land) of corn. I sold about two tons, and as there was no market for the rest I fed them to my cattle and I think with very good results. First, in increasing the flow of milk from the cows, in adding to the richness of it and in giving a very fine aroma to the butter and making it a nice yellow, equal to June butter. I also fed to three head of stock that were fattening and they gained very fast, indeed, but as I had no scales with which to weigh them, I could not tell how fast. A couple of calves, also to which I gave a few, grew beyond all precedent, so that I am convinced that there is great feeding value in them and shall try a larger field of them this season, and if desirable, will report the result.

I might give some few figures but do not know as they would be of interest to you, as my experiments were not exhaustive enough to form any sufficient test as to the exact amount gained by feeding the squashes.

I am looking quite anxiously for your report and hope to receive it as soon as published.

Yours very respectfully,
J. S. SILL.

ANSWER.

The only record I have of squash analysis is one published in the Connecticut Agricultural Experiment Station Report of 1884. This is as follows, and for sake of comparison, I also append analysis of beets (Mangolds).

	Total dry matter.	Protein.	Fat.	Nitrogen free extract.	Fiber.	Ash.
Squash, ...	5.12	.66	.28	3 24	.34	.40
Beets (Mangolds),	7 96	1.70	.20	4.19	.82	1.05

While the Station has made no practical tests of the feeding value of the Hubbard squash, I know it to be a cheap and valuable stock food. When in charge of the Horticultural Department of Cornell University, I kept an accurate account with one half acre of Hubbard squashes and found that the crop cost a trifle less than $3.00 per ton.

TREASURER'S REPORT.

J. C. STEVENS IN ACCOUNT WITH OHIO AGRICULTUAL EXPERIMENT STATION.

Receipts.

From State Treasurer.

Balance on hand March 7, 1885	$1,738 41
Appropriation for 1886—current expenses	5,000 00
" " new building	1,000 00
Total	$7,738 41

Disbursements.

Current Expenses.			
Salaries	$1,820 00		
Labor	1,973 62		
Equipment, merchandise, implements, etc	1,081 35		
Postage, printing and stationery	339 07		
Express and freight charges	57 99		
Expenses of Board and officers	204 60		
Total		$5,476 63	
Building Fund.			
Lumber	$530 87		
Stand and sand	75 73		
Stone mason	39 70		
Mill work	47 76		
Carpenter work	188 00		
Plans	25 00		
Hardware and tin work	92 94		
Total		1,000 00	
Total expenditures			$6,476 63
Balance on hand			$1,261 78

MEMORANDUM.

This statement covers the expenditures from March 7, 1885, to March 15, 1886. The current expenses to the close of the year (May 1st) will entirely exhaust the balance on hand. The salary of the chemist and the expense of distributing the Annual Report must come from this balance, leaving scarcely enough to pay the usual labor account.

The smallest amount usually appropriated to any experiment station in the United States, excepting that of the State of Ohio, is $8.000.

In order to successfully carry out for another year the work now fully inaugurated at the Ohio Agricultural Experiment Station this sum is required.

J. C. Stevens,
Treasurer.

Emmett Mix,
W. N. Cowden,
Auditing Committee.

Acknowledge the receipt of this, if you wish subsequent reports.

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